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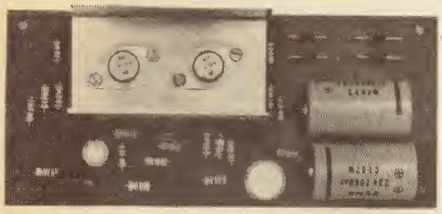
Incorporating "RADIO, TELEVISION and HOBBIES" and "MODERN WORLD"

AUSTRALIA'S LARGEST-SELLING ELECTRONICS & HI-FI MAGAZINE

VOLUME 34, No 6

CONSUMER ELECTRONICS SHOW: An on-the-spot report from Chicago by Alex Encel begins page 14. Here, Mr Encel gets the sales story of the McAdam Tester, which measures all critical factors of audio equipment, including harmonic distortion, RMS voltage, continuous power output and frequency response, and presents the information in digital form. The makers claim that for in-store demonstrations, the tester "turns lookers into buyers".



UNIQUE POWER SUPPLY / MODULATOR: Using a novel hybrid circuit technique, this interesting device combines the functions of variable and regulated power supply and transformerless series modulator. Page 35.

On the cover

Holland, like most other of the industrially advanced nations, is active in the field of radio astronomy. Our cover picture shows the control desk of the radiotelescope installation at Westerbork. Picture by courtesy of Philips Industries Ltd.

CONTENTS — SEPTEMBER, 1972

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EDITORIAL VIEWPOINT

Colour TV reception: good news

Some of the questions I raised in my editorial in the July issue discussing colour TV reception problems have already been answered in the affirmative, I am happy to report.

A short time ago one of the local TV stations carried out an investigation into the matter on a semi-official basis. For a short period one morning they radiated colour programs fully complying with the now-established Australian PAL colour standards, and a group of industry representatives, government officials and other observers were able to watch the reception at a location where it was possible to vary the reception conditions over a wide range. The facilities were arranged so that the received picture could be viewed in either colour or monochrome for comparison.

The results were very encouraging, suggesting that colour reception is likely to be far less of a problem than had been feared.

Virtually all of the observers were agreed that the effects of ghosting and other multi-path effects on the colour picture were no worse than on the monochrome picture. When the picture was unwatchable in colour, it was also found to be unwatchable in monochrome, and conversely when it was judged acceptable in monochrome it was also found acceptable in colour.

In fact the reaction of many observers was that for identical reception conditions, the subjective effect of ghosts on the colour picture was less serious than on the monochrome.

At the very least this result suggests that some of the articles on the subject which have appeared recently in the popular press are unduly alarmist. Certainly in this category is the story which claimed that more than 200,000 Australian homes would be unable to watch acceptable colour pictures unless serviced by community antenna (CATV) systems.

This is not to say, of course, that colour TV will not involve serious reception problems. As I noted in my earlier editorial, those viewers unlucky enough to have serious reception problems with the present monochrome transmissions will almost certainly have problems at least as serious when colour commences. For these people, community antenna systems may well be the best way of achieving reception of acceptable quality.

It is important that the merits of CATV and other wired-communications systems be considered objectively, and not just in the narrow context of colour TV reception. They are undoubtedly destined to play an increasingly important role in our whole way of life.

Finally, an admission: my statement that the PAL system cannot cancel the colour effects due to multiple-path reception was wrong, as a number of readers hastened to show me. My thanks to these people, and apologies for the error.

— Jamieson Rowe

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NEWS HIGHLIGHTS

New way to make FETS — accurate 1-micron channels

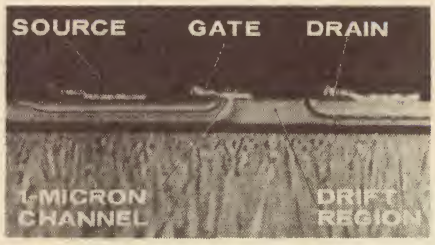
Signetics, a major US manufacturer of ICs, is now offering its first discrete device: a microwave FET made by a new process called "D-MOST", for "Double Diffused Metal Oxide Semiconductor Technology."

The company claims the new SD200 FET is ideal for critical amplifier applications because it combines high gain with low cross-modulation, low noise, and low feedback capacitance. A dual-gate version, the SD300, is also available.

The new n-type FET, designed for frequencies between 500MHz and 1GHz, owes its impressive specifications to a relatively simple double-diffusion process developed during three years of intensive research by Signetics.

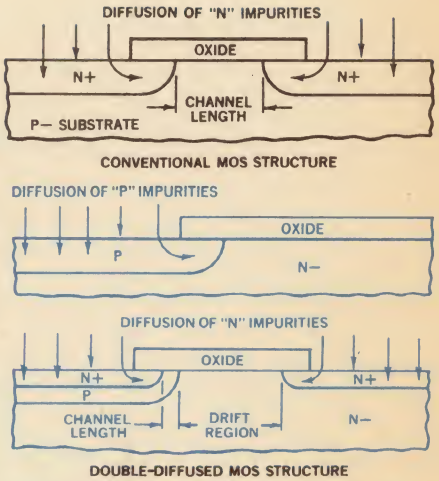
With the conventional FET process, n+ impurities are diffused through windows of a very accurate mask to leave a channel region between them in the p- substrate under the oxide. The channel occupies most of the area between the source and the drain, and is difficult to dimension accurately.

The D-MOST process starts with n-substrate, diffuses in p impurities through a single window, then follows the p layer with an n+ diffusion through the same window. The surface edge of the p layer becomes the channel, the length of which can be accurately controlled by diffusion time. One-micron channel lengths can be accurately produced.



D-MOS TRANSISTOR in cross-section clearly shows the 1-micron channel to the left of the drift region. Need for micron-dimensioned masks is eliminated.

Both versions of the new transistor are hermetically sealed in the same type of standard 4-lead JEDEC "TO-46" package. (Signetics Corp, 811 East Arques Av, Sunnyvale, California 94086. Australian representatives are Tecnico Electronics, Marrickville, NSW).



IN DOUBLE-DIFFUSED MOS STRUCTURE, bottom, channel length is short compared with drift region, but in usual MOS structure (top), channel occupies most of region between source and drain. New process is simple and enexpensive.

Electronics and art — a light and sound concert at ANU

A multi-media concert of light and sound to be held at the Australian National University, Canberra, this month will be the most ambitious of its kind ever to have been staged in Australia.

In the concert more than 1,000 visual images will be projected to provide an ever-changing context in which the audience will hear specially commissioned music.

The initiative for the concert was taken by Adelaide artist Stan Ostoja-Kotkowski and composer Don Banks, an Australian based in London. The two men met early this year while on Creative Arts Fellowships at ANU.

Stan Ostoja had for some time been experimenting with the use of electronics for artistic purposes and he soon found much of interest in Don Banks' work in electronic music. Since arriving at ANU in January Don Banks has spent much time composing and furthering his research into the use of electronic music. Stan Ostoja has done much research into the linking of sound and colour, and during his Creative Arts Fellowship at ANU he experimented with a number of techniques in which art and electronics came together.

Together the two artists conceived the idea of an audio-visual concert. This had developed to include not only compositions by Don Banks but new works by Canberra composers Larry Sitsky and Donald Hollier and Sydney composer John Crocker. The works by Sitsky and Hollier will be for a combination of piano, Moog synthesiser, electronic organ, percussion, clarinet, horn, cello, voice and three synthesisers.

Donald Hollier is Principal Music Study Teacher at the Canberra School of Music, where Larry Sitsky is head of the Piano Department. John Crocker, who is the only Australian composer to have been represented at international surveys of electronic music held in New York (1970) and London (1971), will write purely electronic music. Sydney jazz musician Don

ADELAIDE ARTIST Stan Ostoja-Kotkowski (left) adjusts an amplifier which is part of the equipment he uses to create patterns of light in rippling liquid. At right, Australian composer Don Banks at keyboard of Moog synthesiser in his studio at ANU.

Sizzling!

the only word to describe the extraordinary performance of the new Wharfedale "Denton" and "Linton" compact speaker systems.

Building effective compact speaker systems requires technical *"know-how"* and *experience* — and that's where Wharfedale really shines. For over forty years Wharfedale has been Britain's leading manufacturer of high quality wide range loudspeakers; Wharfedale advances in technology are very obvious in the all-new "Denton" and "Linton".

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A long throw voice coil is used in the bass speaker to provide restraint-free lower registers and the new 2" tweeter is the result of intensive Wharfedale research — high frequencies are smooth and satisfying. Large magnet structures offer greater sensitivity.

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LINTON 2.

Size: 19" x 10" x 9½"./Frequency response: 55-17,000 Hz. ± 3 dB./Power rating: 20 watts DIN./Speaker complement: 8" bass, 2" tweeter./Crossover frequency: 1,200 Hz./Finish: Oiled teak or polished walnut.

LINTON 3.

Size: 19" x 10" x 9½"./Frequency response: 55-17,000 Hz. ± 3 dB./Power rating: 25 watts DIN:/Speaker complement: 8" bass, 4" mid-range, 2" tweeter./Crossover frequencies: 1,100 and 4,000 Hz./Finish: Oiled teak or polished walnut.

DENTON 3.

Size: 14" x 9¾" x 8¾"./Frequency response: 65-17,000 Hz. ± 3 dB./Power rating: 25 watts DIN./Speaker complement: 8" bass, 4" mid-range, 2" tweeter./Crossover frequencies: 1,100 and 4,000 Hz./Finish: Oiled teak or polished walnut.

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SG-WNP-4

Burrows and his quartet will mix their improvisation with electronic music for the concert.

Throughout the 90-minute performance there will be instrumental and vocal music, taped and live electronic music, all integrated with visual images projected on a total of six screens with a total width of forty-five feet. Some of the images will come from two laser chromasonic units designed by Stan Ostoja.

Much of the vast battery of electronic equipment needed for the concert will come from Don Banks' studio on the ANU campus.

The dates for the Canberra performance are 26-30 September. It is possible that it will be seen later in other States.

New Indian TV station

India's second major television studio, at Bombay, is ready. It has been handed over to Indian technicians after completion by a team of German engineers.

The studio, like the one in New Delhi, is a gift from the Federal Republic of Germany. Installation of equipments such as a 10kW transmitter, five studio cameras, a five-camera mobile studio for outdoor shooting and film scanners for reproduction of movie films, is now complete.

Under the terms of an Indo-German partnership agreement signed in October 1969, West Germany has supplied and installed the technical studio equipment and India has constructed the buildings and structural works including the antenna tower. Under the same agreement, Indian engineers and program personnel are attending advanced courses at the Radio and TV School in Berlin while a five-man team of German advisers in Bombay is assisting the Indian staff in preparing for the start of regular broadcasts.

The Government of India has decided to make the New Delhi Television Centre the nucleus of the expanding television network in India. TV coverage will reach about 40 million of the country's population by March 1974, according to official calculations.

To begin with, the New Delhi TV Centre has extended its range to 60km and the duration of programs to 3½ hours daily. There are now 37,000 TV sets in India's capital.

The next two years will witness the setting up of TV stations at Srinagar, Bombay (with relay facilities to Poona), Madras, Calcutta. Lucknow (with relay facilities to Kanpur), and extension of the New Delhi Centre to provide relay facilities to parts of Punjab and Uttar Pradesh. The Bombay and Srinagar stations will start broadcasts before the end of 1972. The Madras station will be ready by the end of 1973, and Calcutta and Lucknow stations by March 1974. A TV training centre has been set up in New Delhi with assistance from United Nations Development Program (UNDP).

from N. Viswanath, New Delhi

Communications careers on film

A film explaining careers opportunities in communications and electronics has been produced by the Communication Industries Division of the Royal Melbourne Institute of Technology.

The film, which was shot in 16mm colour, covers the activities of many organisations including the PMG, State Electricity Commission, Philips Telecommunications, Bureau of Meteorology, ATV Channel 0, Nixdorf Computers, Bill Armstrong's Audio Visual Studios and Petroleum Refineries Australia.

Education Department director-cameraman, Wolfgang Kress, seconded to the Technical College of RMIT said that, apart from being used at RMIT, copies of the film would be made on 8mm film for the Careers Reference Centre of the Department of Labour and National Service.

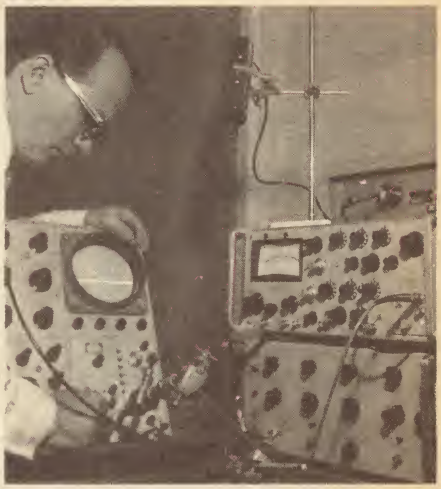
Silicon diode demodulates laser light

How do you test a diode that is capable of detecting UHF modulation on a laser beam? In the AWA Physical Laboratory in Rydalmere, NSW, Mr V. Svoboda is shown investigating the demodulation of a 6328 Angstrom laser beam using a new AWA type AWM 1359 silicon PIN diode.

The diode was designed to detect amplitude modulation at frequencies up to 6GHz, on carriers of visible or infrared light, for use in wide-band optical communications systems.

In the test set-up shown a laser is made to oscillate in a number of modes, separated from each other by 700MHz. Any three adjacent frequencies resemble the spectrum of an amplitude modulated carrier, so the different modes of laser oscillation appear as amplitude modulation of the laser output.

Such an output is a convenient source of light, effectively modulated at UHF, for use in experiments with devices such as wide-band diodes.



AWA's laser demodulation test set-up at Rydalmere

Calculator has part-time power

Clive Sinclair, well known hi-fi innovator, has designed a pocket calculator that will truly fit in your pocket — it measures only 5.5 by 2.25 by 0.375in and weighs only 2.5 ounces.

Reduced size was made possible by use of tiny 1.3V mercury cells to operate the calculator. Sinclair has cut the power consumption of the unit's IC from the normal 300mW to between 20 and 30mW, and claims the small cells will give up to 20 hours of operational life.

The calculator uses the standard Texas Instruments 1802 MOS calculator chip, but Sinclair has cut power consumption by turning it off for a large portion of the time. The chip is turned on and off at a 200kHz rate while it is working. Each clock pulse turns the chip on for 1.7 microseconds, and for the following 3.3 microseconds it is off. This clock rate is maintained only for 100 milliseconds after a key is depressed, and during idle, the chip is off for even longer periods: about 65 microseconds at a time.

Since the TI chips were not designed to be operated this way, Sinclair checks each chip's power threshold to be sure it will give reliable operation with the new pulsed power method. He gives a five-year guarantee on the calculator, which sells for only $165 in the UK, so he must be confident that the method will work.

FILM SEQUENCE for electronics careers film is being discussed above by Mr Kress and Mrs B. Kent, an operator in the crystal section of the Philips Telecommunications 2-way radio factory in Clayton, Victoria.

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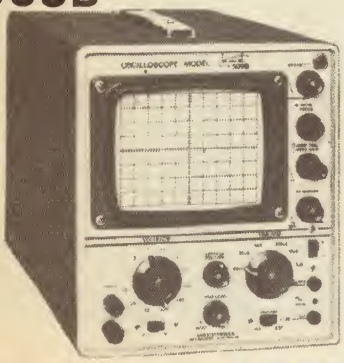
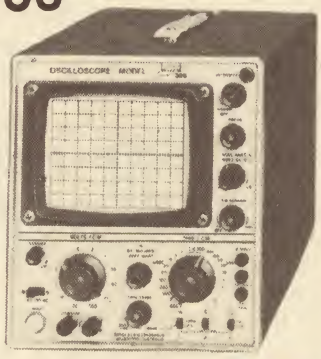


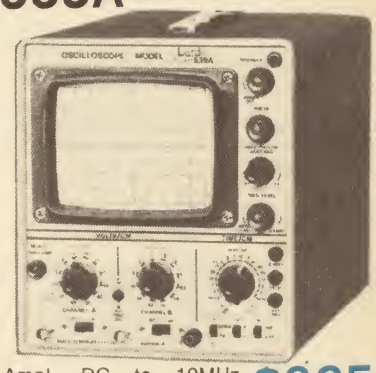
Ampl. DC to 7MHz. 10mV 50V/cm. T.B. 200nS - 1S /cm. 2Hz - 10MHz trigg **$205**

506



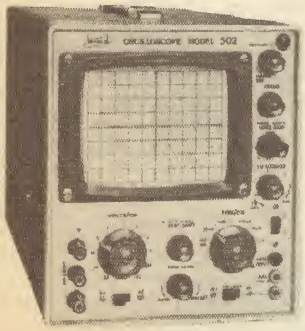
Ampl. DC to 15MHz. 5mV - 50V/cm. T.B. 50nS-10S/cm. 15MHz trigg. Isol grnd. **$304**

539A DUAL TRACE



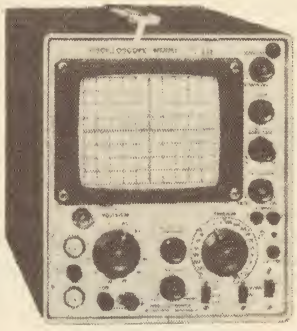
Ampl. DC to 10MHz. 10mV - 50V/cm. T.B. 200nS-2S/cm. Triggering 2Hz-10MHz. **$365**

502



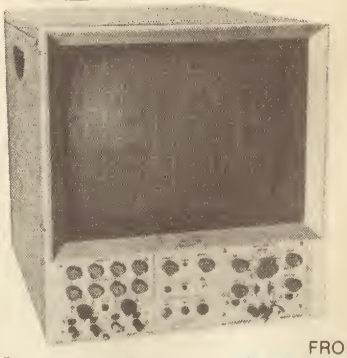
Differential Ampl. DC to 3MHz. 20mV to 50V/cm. T.B. 200nS-1S/cm. Isolated grnd. **$350**

511



Differential Ampl. DC to 10MHz at 10mV 5Hz 4MHz at 1mV T.B. 40nS-10S/cm. Isolated grnd. **$430**

1722



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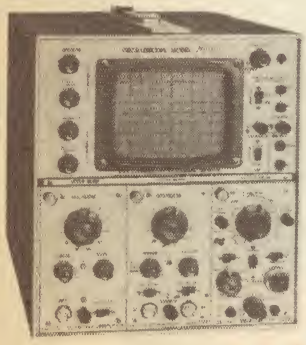

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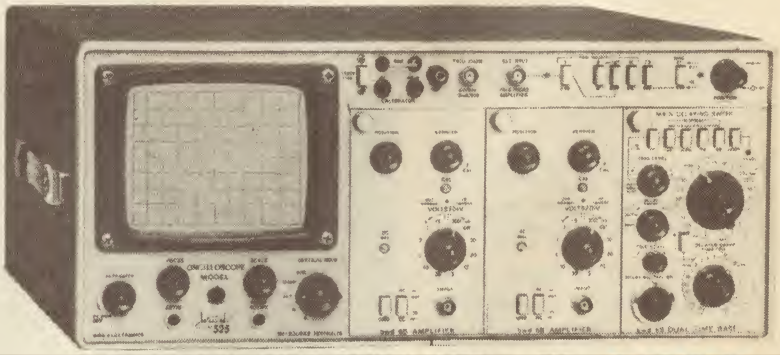
525 DUAL TRACE



Ampl. DC to 50MHz 5mV to 50V/cm. T.B. 10nSec - 10Sec/cm. 70MHz trigger delayed sweep, trigger and mixed display. 10KV EHT internal 8 x 10cm. graticule. **$1200**

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NEWS HIGHLIGHTS

Colour tube with no convergence adjustments

RCA's permanently attached yoke is adjusted for convergence, then cemented to the tube at the factory. Electron guns are arranged side-by-side.

American colour TV tube makers are moving toward the Sony Trinitron concept in their new lines of smaller sized colour tubes. GE, Sylvania and RCA are all bringing out new lines which use vertical-slit shadow masks and phosphors arranged in vertical lines instead of the tri-dot pattern of the old delta system.

This marks the first major design shift for American makers since the tri-dot technique was introduced in 1954. The major advantage of the verical slit system is more picture brightness. Also, errors in vertical positioning do not cause colour differences.

But the real advancement in tube technology is in the yoke. The GE and Sylvania designs have reduced the dynamic convergence adjustments to four from the 12 required with the delta system — and RCA has completely eliminated convergence adjustments.

The Trinitron requires two static and one dynamic adjustment.

RCA's trick is a permanently attached yoke, cemented to the CRT, that eliminates all adjustment circuitry. The new tube is compatible with solid state circuitry, so a custom-designed chassis is not needed.

The new static toroidal deflection yoke is simple to manufacture. Both horizontal and vertical deflection coils are precisely positioned in preset grooves which are moulded into plastic rings cemented to either end of the yoke's ferrite core. It uses less than 80% of the copper wire needed for the older types.

The tube, to be made in 15-, 17-, 19-inch sizes, has a 90 degree deflection angle. It is almost 2in shorter and 2lbs lighter than present 90 degree tubes.

Philips gets wide industry agreement on VCR format, but seeks more

In a move to get world-wide standardisation of video tape cassette systems, Philips is freely offering details of its "VCR" cassette system to any manufacturer who will sign a standardisation agreement. Philips successfully followed the same course in the early 1960s to get industry-wide agreement on the format of the audio "Compact Cassette".

The VCR system, shown in operation at the left during a PAL colour demonstration in Melbourne last month, is similar to the Compact Cassette system in appearance and ease of operation, although the cassettes are of necessity much larger to accommodate the ½in video tape.

In Europe 10 companies manufacturing PAL colour TV equipment have already agreed to adopt the VCR system, with three more expected to sign agreements soon.

At least one American company, 3M, has agreed to use the VCR format for all apparatus it sells in Europe and any other country using PAL or SECAM colour systems. North American Philips Corp has made a proposal in the US to the Society of Motion Picture and Television Engineers to make VCR a standard system in the US, but with the number of competing systems now being designed there, Philips will undoubtedly have a much tougher time than they did in Europe.

Shiba Electric Company of Tokyo will present an official standardisation proposal to the Japanese Electronics Industries Association. Here again, there are several competing systems ready for the market.

NEWS

Satellite power station?

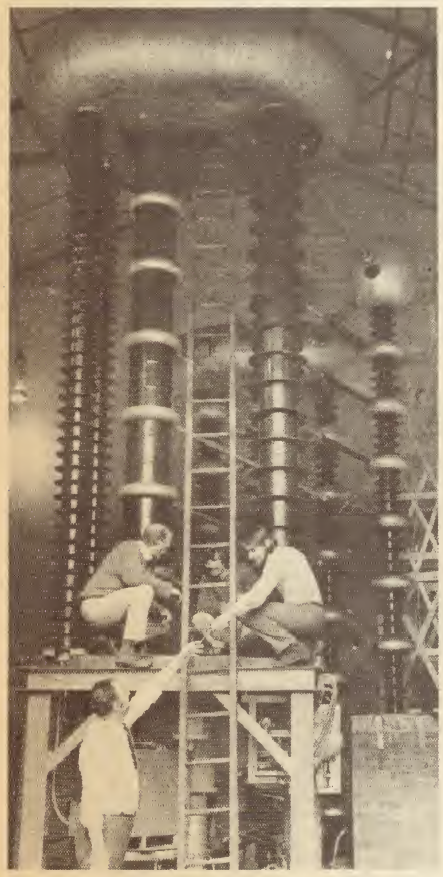
NASA has let a study contract to explore the feasibility of using large satellites to beam down electrical power to the Earth. Such a solar power station would convert solar energy to electric power in space and transmit the power via microwave to Earth for distribution.

The proposed satellite would be in synchronous orbit at about 22,300 miles. It would transmit 10,000MW of power to a 6-mile-square receiving antenna on Earth. The transmitting antenna would be one mile square.

The station would have a 5 miles square array of solar power cells connected to the microwave transmitter by a 2-mile electrical transmission line. The latter would have rotary joints at both ends to permit the transmitter to follow the receiving antenna.

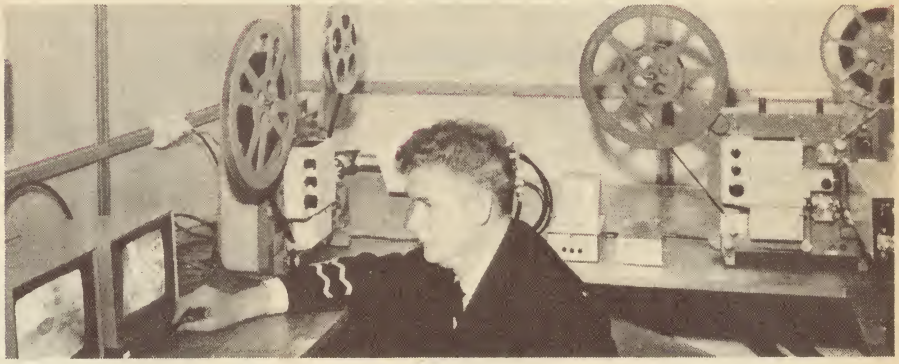
NASA is comparing the concept with other methods of producing large amounts of power (megawatts) on Earth from the Sun's energy.

Veteran accelerator



One of the original Cockcroft-Walton accelerators, now at the University of NSW, is being computerised. Used for heavy ion implantation experiments, the veteran has several years of life left in it. Working on it are (left-to-right) Prof J. C. Kelley, Head of Materials Radiation Laboratory; Dr Gordon Chapman; Miro Novak; and in front, Boris Pantic, the engineer who runs the machine.

"Australian Trader" installs telecine equipment



First marine installation of an AWA Rediffusion telecine system has been carried out in the Australian National Line vessel, "Australian Trader".

"Australian Trader", which operates between Sydney and Hobart, takes 36 hours for the journey. As for part of this time it is not possible to receive shore-based television programs, passengers are provided with a choice of films which the two-channel telecine system screens on television monitors.

The system consists of two RT100 cameras which feed 25-inch monitors located in various passenger and crew areas.

Both cameras are synchronised by a sync generator and facilities are included to switch between projectors to provide a single channel outlet on feature films.

Car safety radar uses passive frequency doubler

RCA has demonstrated an experimental automobile radar designed to prevent highway rear-end collisions by tracking cars ahead and sounding a warning when the separation distance becomes unsafe.

The compact radar, mounted on the front of a car, transmits a continuous signal which is received by a novel, passive reflector on the rear of the vehicle ahead. The reflector doubles the frequency of the transmitted signal and reflects it back to the radar.

By measuring the time required for the signal's round trip, the radar calculates distance to the car in front and flashes a light and sounds a buzzer when the separation distance decreases below one car length for each 10 miles-per-hour of speed of the car carrying the radar. Range of the radar is 100 yards.

The radar still requires testing and refinement, but RCA scientists believe that an operational system, including both the transmitting / receiving radar and the special reflector, can be mass produced within five years at a cost to the consumer of between $50 and $100 per car — approximately the price of many car radios now being installed in cars for entertainment.

A key feature of the RCA radar is its rejection of "ground clutter" — false targets created by signals bouncing off highway signs, bridges, overpasses, trees, and other roadside objects. This is achieved by making the radar responsive only to those signals produced by the reflector unit at double the transmitted frequency, or the "second harmonic."

Since the signals reflected by the highway itself and roadside objects are not at this second harmonic, they are ignored by the radar. The sensitivity only to the doubled frequency also prevents the interference and "blinding" that normally would occur when two radar-equipped cars travelling in opposite directions pass one another.

The experimental radar transmitter / receiver employs all solid-state electronics and measures 17 by 8 by 2-1/2 inches. It is mounted on the front bumper bar of the car, but an operational version could be smaller and concealed in the grillework or behind a nonmetallic front number plate.

The reflector is the same size as the radar, except it is only one-half inch thick. It is completely passive and requires no power or wiring. Its simplicity would allow it to be produced for under $10, and therefore it could be readily adapted to even the oldest cars still operating on the highways. It could, in fact, be combined with the rear number plate.

The reflecting antenna makes all vehicles equipped with the passive reflector equally visible to the radar. Thus, a compact car is as easily tracked as a large tractor-trailer, and its radar echo cannot be "swamped" by one from a larger vehicle. The radar beam is narrow enough so that when a car moves out into the right lane to overtake a car ahead, the signal is not reflected and the car can go ahead and overtake without a warning being sounded.

The system also could be employed to prevent cars from entering one-way streets or highway access lanes from the wrong direction. All that would be required would be to position a reflecting antenna at the "wrong" end of the street so that the car radar would detect it and warn the driver when he approached the street.

Since the radar signal penetrates bad weather and smog, it could play a major role in preventing the multi-car pile-ups that often occur in heavy fog, rain and dust storms.

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A DIVISION OF INSTROL

Consumer Electronic Show, 1972

an on the spot report from Chicago by ALEX ENCEL*

Huge crowds, security guards everywhere, high labour costs from rigid trade union control, pretty girls in brief costumes, aggressive promotion of products, conflicting opinions on 4-channel sound — these are some of the impressions gained at the recent Consumer Electronics Show.

McCormack Place, where the CES is held is a huge, modern two-storey hall, situated only ten minutes drive from the Chicago city area, with a superb view over the adjacent Great Lakes.

I followed the advice I was given to stay at the Hilton hotel, right in the centre of the city. This is the most popular place for exhibiting firms to have their private displays of equipment. Each evening, when the exhibition is closed, you can visit these various private exhibits, listening and discussing products, while eating salad and drinking wine, until the early hours.

Entry to the fair is restricted to people connected with the audio and electronics industries, and they are reasonably strict about this. Visitors have to establish their connections before getting a pass, and without a pass you just cannot get in. No children are allowed in, even with people who have passes.

Security arrangements are quite strict. Each time you go in, two security guards (sometimes both male, sometimes a male and a female) check your pass. If you do not have a pass, you do not go in. It's as simple as that!

Security guards are an established feature of the American scene. Theft is a great problem, and banks, airports and hotels all have security guards from one firm or another. They really amount to a private police force, and take their work very seriously.

The Chicago Show is huge, but it was not the size alone which impressed me. I have been to other audio shows in Europe and Japan, and some of the Japanese shows are not much smaller than the Chicago Show. As well, the Japanese shows are usually more precisely arranged, with a very high overall standard of neatness and attractiveness in the design of the stands.

The impressive feature of the Chicago Show is the vitality everywhere evident, and the emphasis on promotion. In the Press Room, all the larger firms exhibiting, and many of the smaller ones as well, have thick Press Kits. These contain a mass of information praising the rare or even unique features of the latest range of models exhibited. They tell why these will sweep the opposition equipment under the carpet, and detail the advertising campaigns supporting the products. In addition, there are expensive photographs in colour or black and white, and a letter from the Public Relations firms handling the launching of the products.

Little gifts are also to be found in some of them — I acquired a neat little combination knife, screwdriver, nail file and bottle opener to attach my keys to!

In the Press Room you have the impression that no expense has been spared, and later on, when I found out the prices exhibitors had to pay for stand space, I could understand why. It costs a lot of money to exhibit, and the organisers are very conscious of the need to obtain the maximum favourable publicity. The Press reporter is king, so free meals, free drinks and free evening entertainment of one sort

* **The author is Managing Director of International Dynamics (Agencies) Pty Ltd.**

The stands are "manned by sales staff and pretty girls in abbreviated costumes..." The author chats with a girl attendant on one of the stands.

or another are the norm where the Press is concerned.

Stand costs, depending on the size, ran from a few thousand dollars for a very small one up to tens of thousands of dollars for larger ones. This is before you start erecting the stand — something which can cost more than the stand itself. Union regulations are very strict and at the Rotel stand I was told that to move one carton from the door to the stand costs $35! The stand owners were not allowed to move it themselves, even though one man could have done it quite easily.

The stands are "manned" by sales staff and pretty girls in very abbreviated costumes. They smile at you, and pin badges and stickers on you, but since nearly 30,000 visitors visit the show, it becomes rather mechanical.

Upstairs, where the bigger and more expensive stands are located, you find the familiar names like Sansui, Rotel, Pioneer and so on. As you wander round the stands, you realise how much "American" audio is actually made in Japan with the label of the American company on the Japanese product.

In American audio shops you sometimes hear people saying they want American products. They end up with an American name amplifier which is completely made in Japan, without even knowing it!

Though American-made amplifiers are fading, especially in the more normal price ranges, American speaker designs are coming out with increasing frequency. Sometimes they are simply re-packages of existing speakers and you can recognise the standard drive units used in them. But quite a few unusual designs are coming forward and it is unfortunate that you cannot really hear them properly. In the evenings when you go to the demonstration rooms, where demonstrators work on the assumption that you are deaf, it was rare to find a demonstration amplifier under 200 watts RMS.

On one stand there were 1000 watt RMS amplifiers and at one stage in an evening the volume control was put full out and everything in the area was shaking. Personally, I could not stand it and, when I noticed the following morning that the stand operator had cracked teeth, I could not help wondering if this was connected with the sound level.

Partly because of the accent on loudspeaker design I met a number of the more celebrated designers. I was struck by the completely different approaches they had come up with to solve the same problems. Their eyes flash as they explain why their approach of using one speaker instead of nine (or the other way around) is superior, and they often cautiously praise other designers while at the same time condemning their actual designs to the scrap heap.

The main essentials needed for anybody participating in these shows, either as visitor or exhibitor, are pure stamina and a strong stomach. I could see people I knew on the stands gradually running down in energy as the days went by.

As I said earlier, there is an enormous amount of promotional material available. After my first day, I weighed the free books, promotions and product details I had collected (after returning those which were useless to me, as I felt guilty about the waste of all that expensive material) and found that I was still left with over 40lb of printed matter.

One of the major discussion points at the show was 4-channel, but there were plenty of other topics, like standardisation of performance ratings of equipment, regulations, merchandising. In fact, conferences were going on for much of the time. I was exposed to every possible variety of opinion on 4-channel. The only general rule I could make out was that, as the price and professionalism of the product increased, so the enthusiasm for 4-channel seemed to decrease.

In line with this, as many of the lower priced commercial equipments were being promoted on the stands, the stand holders could be heard waxing enthusiastic about the future of 4-channel.

Unfortunately, they came to different conclusions about which system would be adopted, and I heard absolutely convincing reasons why any one of the matrix systems or the CD4 (discrete) system was the only possible choice. Some systems which could allegedly handle any type of matrix or discrete recording had, according to the more professional manufacturers, quality problems, as do most compromises.

It was very hard to separate fact from fiction about 4-channel. The promotion is so intense that everybody who talks to you about it lives and breathes their convincing explanations. This is so much part of the exercise that you get the feeling that, if the sales department came out with a completely different story next day, the same people would live and breathe the new story with exactly the same enthusiasm as the old one.

To give an idea of the confusion about 4-channel, I will quote from the show editions of some of the trade publications:

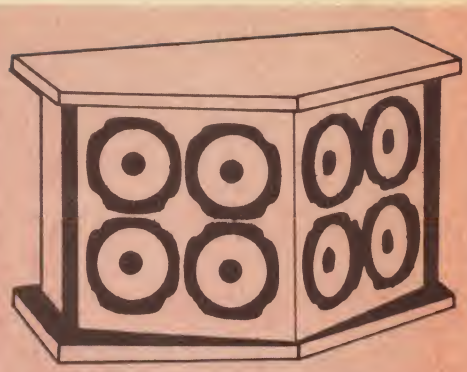
"No need for quad confusion" — Herb Horowitz. He considers the efforts of CD4 advocates to be "unnecessarily divisive". "They are confusing the public. They are confusing the retailer. Even confusing me".

Jack McDonough, audio manager of Hi Fi Fo Fum, in Milwaukee, said his stereo sales had been good and going up, but "our 4-channel market is confused and so it has not taken off the way we would like it to. I blame this on the imperfective state of the art".

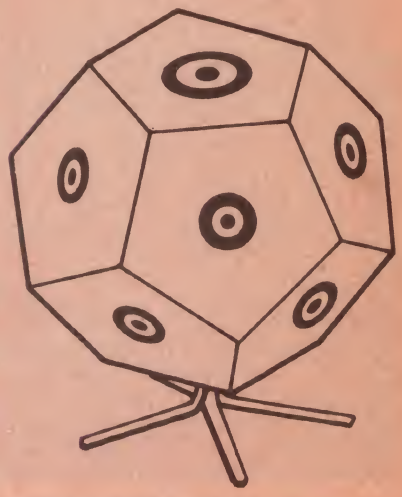
Leonard Bernstein, from Thomas Sound Systems, Oklahoma, says "who in his right mind would buy 4-channel now? It would be plain dishonest and immoral to sell anything else but the inexpensive adaptors to fool around with".

Jim Crow, manager of Stereo Showcase, Sacramento, says: "We feel if a guy is dying to buy 4-channel we will sell it to him, otherwise we usually advise a good 2-channel system which he can expand to 4-channel when the medium becomes perfected".

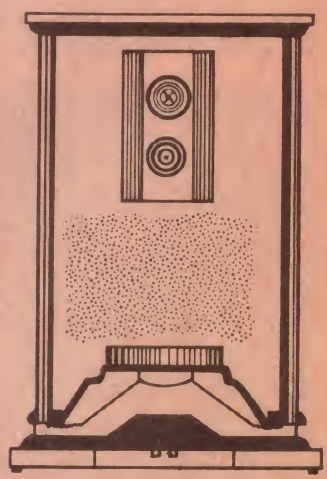
"Merchandising Week", which covers home electronics, housewares and major appliances says, "4-channel surrounds, audio dominates". Trade News Daily prophesied that "the CES will resemble more a battleground, than it did in relatively peaceful 1971 . . . dealers will not be looking so much for what is available as for answers to what they should buy of what is available . . . This is not the time to be concerned with innovation, what with the uncertain section of the market".



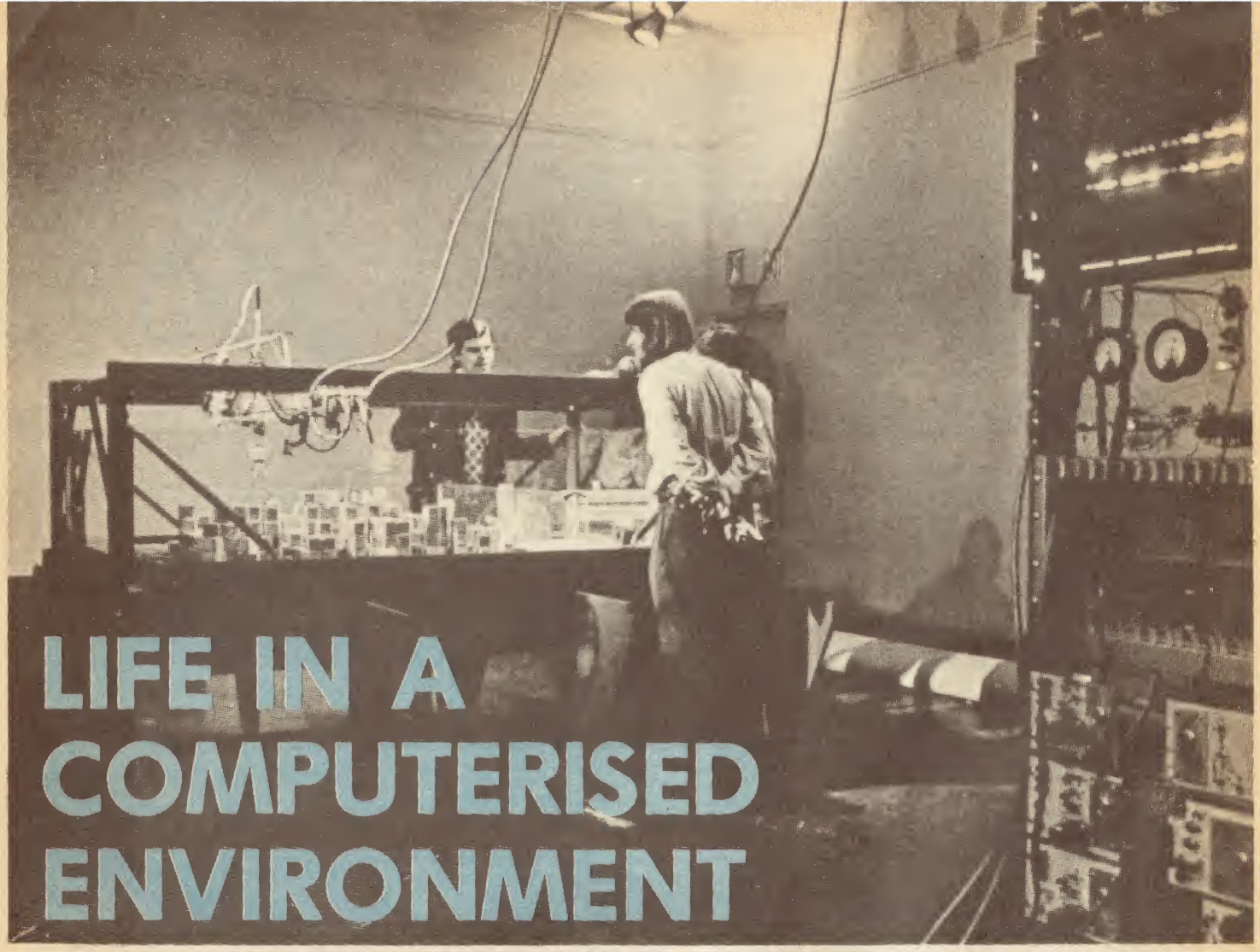
"American speaker designs are coming our with increasing frequency . . . . quite a few unusual designs are coming forward" . . . This rear view of the Bose 901 shows the eight units that provide the reflected component of the sound.



Here is a sketch of the 12 sided Design Acoustics D-12 system. A 10in woofer is mounted on the bottom panel.



This sketch shows the design essentials of the Empire 7500M cylindrical system. At bottom is a 15in woofer, the back of which operates into the large acoustical air space. The dots represent damping material. At top is an acoustic lens holding the dome mid range and tweeter.



LIFE IN A COMPUTERISED ENVIRONMENT

Can a computer be programmed to respond intelligently to unexpected events? A toy-block "city" was the stage for an experimental contest between a simple computer system named SEEK and a small colony of gerbils. The computer's instructions were to keep the "city" in order, but the playful gerbils would not co-operate.

The experiment was set up as a New York art museum exhibit concerned with the interaction between people and machines by the Architecture Machine Group of MIT (Massachussetts Institute of Technology). The group is working on computer systems which can aid architects in solving design problems; not just to solve engineering problems, but to interact with the architect and discuss urban design problems with him.

The computerised environment exhibit was an attempt at showing the problems encountered when living things, such as the gerbils in this case, interact with a machine which is an integral part of their environment. Gerbils are small, furry, mouse-like animals often kept as house pets. They are very active and jump around like small kangaroos.

The gerbils were placed in a large glass cage in which was a 3-dimensional "city" built from metal toy blocks. Ranging over the cage was the sensing and manipulating arm of the computer.

Within the computer's core memory was a 3-dimensional plan for the environment in which the animals were living, and it was charged with the responsibility of keeping the original plan intact if possible. But its most important role was to sense and manage **unexpected** events in that environment under the control of its program. It could stack, align and sort the metal blocks with the aid of a small electromagnet and seven pressure-sensing inputs at the end of its roving arm.

Unknown to SEEK, the little animals were continually bumping into blocks, disrupting constructions and toppling towers. The result was a continually changing mismatch between 3-dimensional reality and the model residing in the core memory of the computer. SEEK's role was to deal with these inconsistencies.

In the process, SEEK did show inklings of responsive behaviour because its reactions were based on probabilities and it was programmed to either correct or amplify (not both) the dislocations caused by the gerbils.

What's the point of all this? Admittedly SEEK is trivial and simple, but it does go beyond the current situation where machines cannot respond to the unpredictable nature of people (or animals).

The Architecture Machine Group, sponsored by the Ford Foundation, is seriously trying to bring urban design back to the ordinary man. They believe that if they can design a computer system which can communicate with an architect untrained in computer programming, they can eventually create a system which can perhaps make every man his own architect.

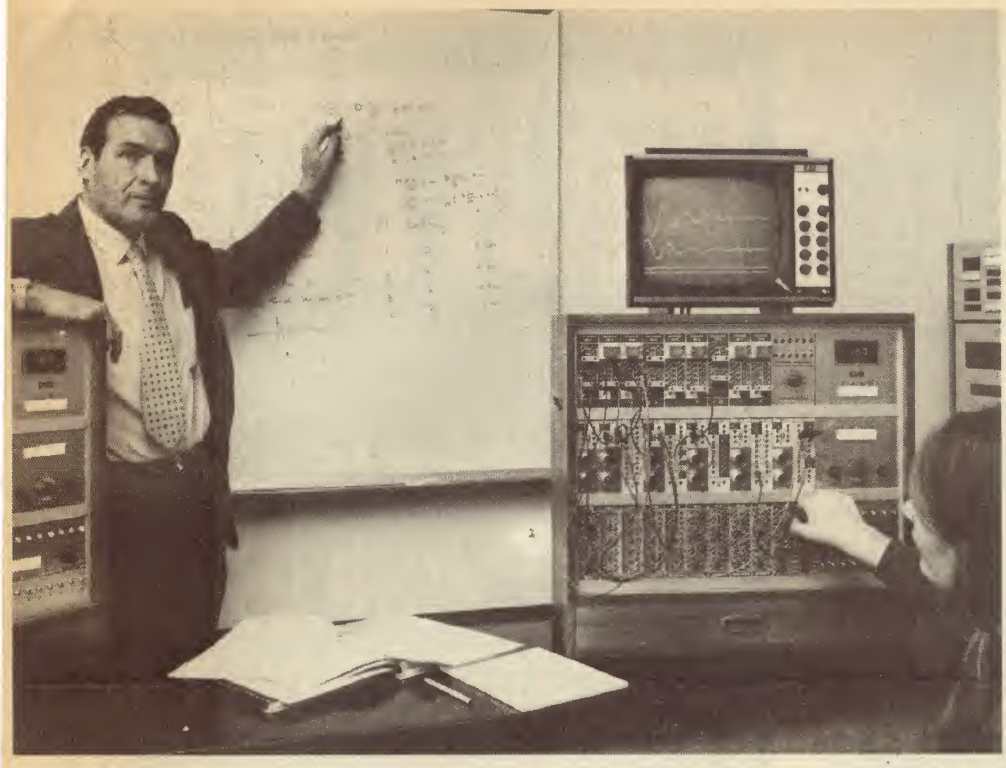
They have already achieved a major advance with a system named URBAN, which converses with architects about urban design problems using basic 10ft cubes as building blocks. Each person who uses the system builds up a memory bank of his own vocabulary and definitions of the words he uses in his particular field of architecture.

Each operator starts completely untrained in the operation of the system, which teaches the operator as it learns his vocabulary.

The group believes that, as homes become wired for video phones and computer terminals, the individual will be able to "chat" with the architecture system about the design of his future home. They are experimenting with the Bell Telephone Company's PICTUREPHONE system at present because it is a good approximation of the future home computer terminal.

Nicolas Negroponte (left), co-director of the Architecture Machine Group, talks with Karl Katz and Steven Gregory at the exhibit. The SEEK computer system (opposite page) and the caged "city" of 2-inch blocks with its jumping gerbils provided an unique contest between living animals and machines. Lone gerbil (below) contemplates its next move.

Hybrid computer for the classroom



Analog computer simulation is most useful when investigating dynamic system behaviour. At left, John Mobbs of EAI-Electronics Associates demonstrates simulation of a spring-mass problem on the EAI 180 mini-computer. Simulated oscillations can be seen on the oscilloscope, or alternatively, on a strip-chart recorder or x-y plotter as shown below.

A small educational computer, designed and built in Sydney, has proved so popular overseas that 65% of its production is being exported. The analog-hybrid computer is used as a teaching aid in science and engineering classes. Dick Levine reports on an Australian development.

Once you have learned how to solve differential equations in your first year of a science or engineering course, it becomes a pain in the neck to continue to solve them manually. Especially when you are trying to understand a dynamic physical concept in something like mechanics, hydraulics or electronics.

A small analog computer not only does all the mathematics for you, but enables you or your instructor to use dynamic mathematical models of a concept and view them in their correct time relationship.

Or you can "slow down time" to look at a dynamic interaction of variables in slow motion. If you wish, you can change any other of the variables and see what happens.

Scale models are still widely used in engineering in such areas as the design of aircraft, motor cars, boats, etc, and can often be used to test dynamic concepts — in wind tunnels, for example. But scale models have one disadvantage in common, they are dedicated to proving out a single design and are of no other value.

A major advantage of the analog computer is that it is not dedicated to a single model, or even to a single engineering discipline. It can provide an accurate simulation of a biological system and of a trip to the moon within a few minutes of one another. That is why analog and hybrid analog-digital computers are widely used tools in research and development laboratories throughout the world.

Since many simulation problems today involve both continuous and discrete subsystems, most modern analog computers have been combined with logic elements to form a hybrid analog-digital computer. Relay switching systems, pulse circuits, and on / off devices of many types can be simulated. Also, the digital side of the system can be used to control the analog side to automatically change variables, sample results and handle many data reduction tasks which would otherwise be time consuming.

Analog-hybrid computers can be used to solve many problems encountered in education situations, such as illustrating calculus concepts, visually plotting spring mass and pendulum problems, and matching experimental data to an exact mathematical model.

In the life sciences it will generate models of living systems, organisms and organs. Also it will do physiological data reduction, cardiac output, tidal volume solutions and similar tasks which are time consuming if done manually.

Computer manufacturers soon realised there was a market for a small hybrid computer for educational purposes — to save an instructor's time, to improve the teaching of changing physical processes and to familiarise the student with computers.

EAI Electronic Associates Pty Ltd, of St Leonards, NSW, although a branch of a large American computer manufacturing company, decided to design and build a small analog-hybrid computer for the local market and for other markets outside the United States.

The result was the EAI-180, a compact solid state mini-computer which has been well received by teaching and training organisations. There are now more than 250 operating, with the majority being exported to Europe and the Americas. An Asian sales campaign is being launched at present.

The EAI-180 can be expanded from a small system capable of solving second order non-linear differential equations, with a time base for X-Y display. A full system consists of six integrators and sufficient computing components and logic to solve an automatic optimisation and plotting of three non-linear second order differential equations.

A standard feature is a new 3½ decade digital panel meter with 7 Seg displays. ICs and FETs are used in circuit construction and the design is such that errors in patching cannot damage the computer circuits, making it "student proof."

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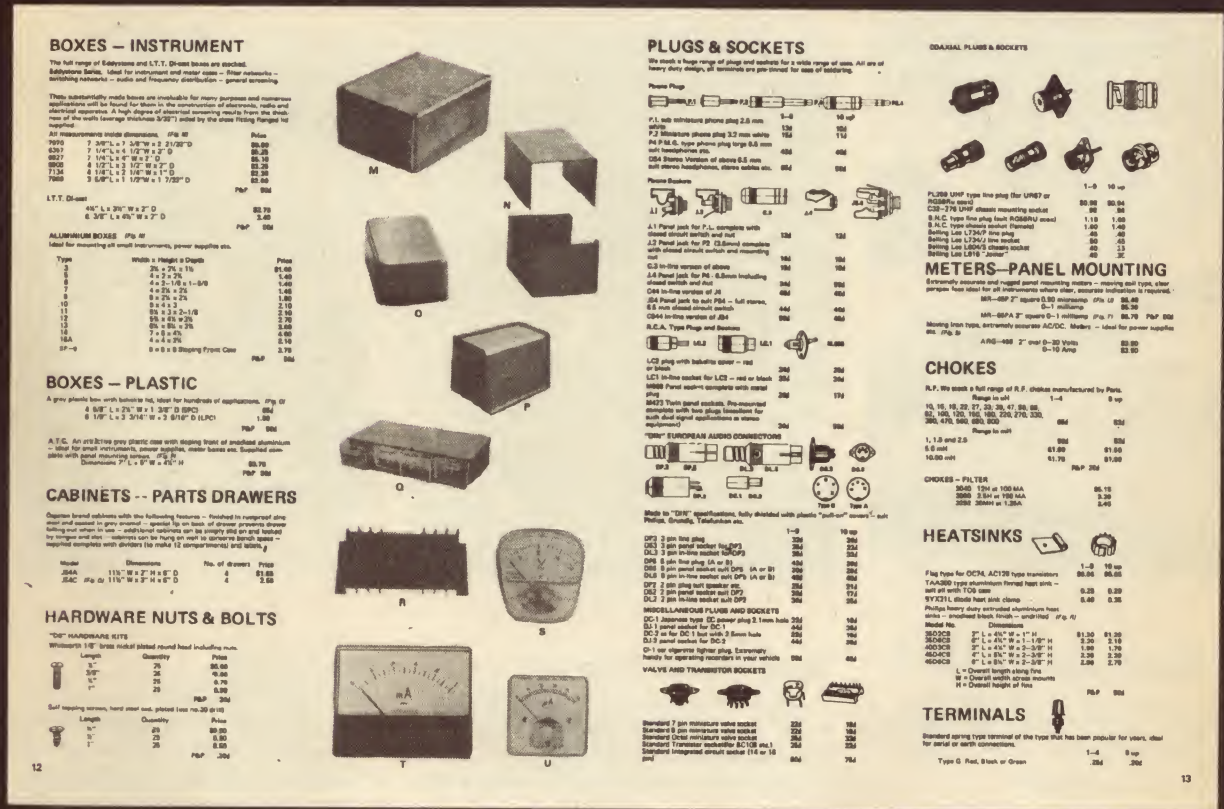

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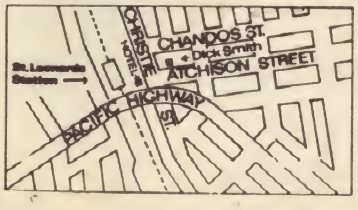

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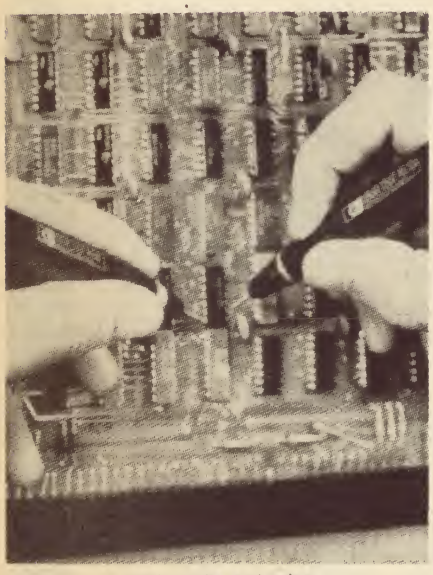
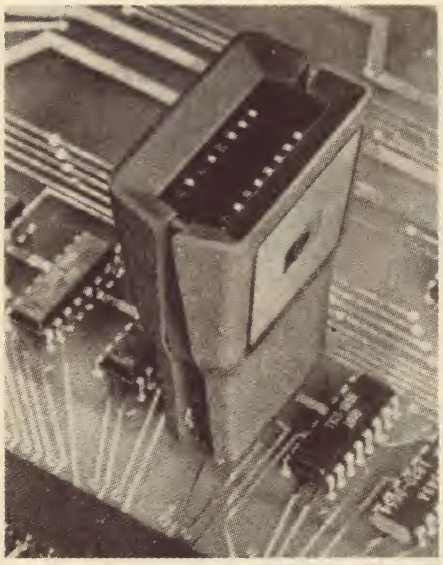
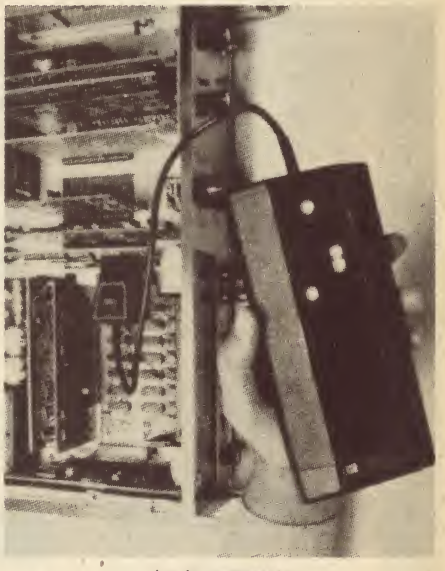


Logic probe and pulser



Logic clip



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Surface waves measured

Just over a year ago we published an article on acoustic surface-wave devices, a technology so unusual that some of our readers refused to believe it. We have since learned that significant research work has been done in Australia on surface waves. Prof L. W. Davies, of AWA Laboratories and the University of New South Wales, reports here on recent experimental confirmation of surface wave theory.

When Lord Rayleigh in 1885 developed the theory of vibrational waves which travel along the surface of a solid, the applications of his theory were to a description and understaning of the waves generated by earthquakes.

In recent years it has been realised that high frequency versions of these surface (Rayleigh) waves might play an important part in meeting some of the requirements of electronics. For example, because the speed of surface elastic waves, being close to that of sound waves, is only one hundred-thousandth the speed of electromagnetic waves, it is possible to introduce large time delays in electronic signals with very small surface wave delay lines.

The wavelength of the surface waves is also 100,000 times smaller than the electromagnetic wavelength: thus, at 100MHz the wavelength is only 30um. With the techniques that have been developed for launching and detecting these miniature high-frequency surface waves it turns out to be possible to have access to the signal at all times during its delay, to combine and recombine non-simultaneous segments of the signal, and to guide and reflect the surface wave signals in a fashion similar to the guidance of microwave electromagnetic signals.

Surface elastic waves on the surface of quartz crystals have been studied for some years in the Physical Laboratory of AWA Laboratories Pty Ltd, located in Rydalmere NSW. Quartz is a material of great interest in considerations of frequency stability, where the stability and temperature-independence of its mechanical vibrations are applied in crystal controlled oscillators, or in crystal filters, to name two devices in wide use in Australia

Quartz is a piezoelectric material, which means that there is a reciprocal relationship between elastic stress and electric fields in the crystal. If the crystal is squeezed, an electric field is set up, and vice-versa.

It is relatively easy to launch and detect surface waves by simple (but very small) metal transducers which are engraved on the surface of the quartz by the same photolithographic procedures used in microelectronics. Delay lines set up with the aid of the above procedures are being applied by AWA scientists in the development of entirely new forms of crystal-controlled oscillator.

Since quartz is a crystal, however, the propagation of waves along its surface differs considerably from the relatively simple predictions of Lord Rayleigh's original theory. The theory of propagation in crystals has been further developed in recent years, but experimental confirmation of the theory has only just been obtained at Rydalmere by AWA scientists, using a modern and miniaturised version of an old technique.

This technique is to use the voltage generated across a conductor when it moves in a magnetic field. The conductor is formed by evaporating a metal (in this case aluminium) onto the surface used for surface wave propagation. The conductor is then photolithographically etched to form a long, narrow conducting stripe parallel to the wavefront of the surface wave.

The width of the conducting stripe is made to be significantly less than one wavelength of the surface wave. Thus the stripe, as the surface wave passes, will move with the exact motion of the surface. A steady magnetic field is applied perpendicular to the stripe. This causes a voltage to be generated which is proportional to the amplitude of motion perpendicular to the magnetic field.

Thus by rotating the magnetic field (keeping it perpendicular to the stripe) voltages are obtained proportional to the motion in the direction of surface wave propagation and to the motion perpendicular to the surface.

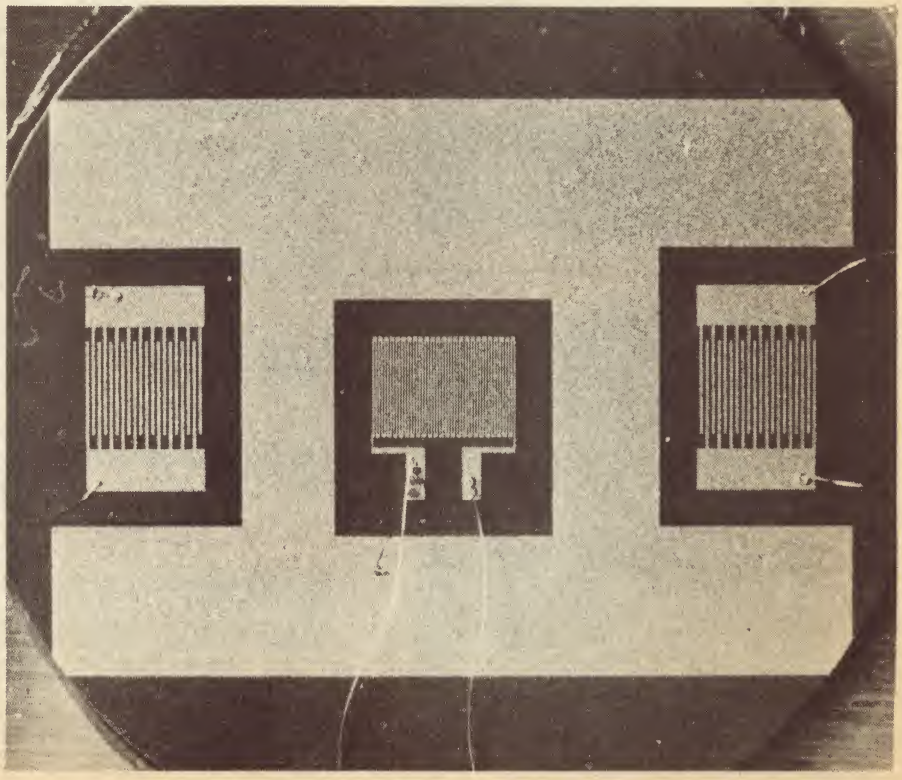
The results of using this technique at the AWA Physical Laboratory were published in Applied Physics Letters on 15 April 1972.

The surface motion due to a surface wave was measured on a particular crystal cut (Y-cut) of quartz, with propagation in a particular direction (X-direction). The motion was found to be elliptical with the direction of rotation retrograde with respect to the propagation direction. The major axis of the ellipse was normal to the surface with the ratio of the axes being 0.67, which agrees very well with the theoretical value. The results obtained show that modern surface wave theory can be used with confidence.

More recently, measurements of surface motion have also been made on piezoelectric ceramics. These materials have a much stronger piezoelectric effect than does quartz, but do not have such a smooth surface; nor are they as stable as quartz.

Surface motion has been measured by a meander line array of stripes, which gives a higher sensitivity at the expense of increased complexity of the result. The accompanying figure shows such a meander line array on a piezoelectric ceramic.

ELECTRODE PATTERNS on piezo-ceramic substrate for launching and detecting surface elastic waves (end patterns), and for measuring mechanical surface motion (central pattern). The stripes in the central pattern are approximately .0002 inch (38 micrometres) wide.



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Above: Quad 33 control unit. Mounted in a convenient accessible position, it selects and controls the radio tuners, gramophone pickup and tape recorder connected to it and feeds the loudspeakers via the power amplifier.

Above left: Quad 303 power amplifier. This unit takes the outputs of the Quad 33 and amplifies them to loudspeaker level. Both channels are housed in one compact unit, which since it has no controls may be mounted out of sight in a cabinet or cupboard.

Bottom left: Quad electrostatic loudspeaker. These, the finest loudspeakers in the world, are used by broadcasting and recording organisations in applications where quality is of prime importance. Very attractively housed. Dimensions—height 31", depth 10½", width 34½".

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4-Channel Discs

the battle lines form up

by NEVILLE WILLIAMS

When technical and commercial pressure flipped the four-channel switch towards the end of last year, the audio industry in USA and Japan came up with a whole array of rival systems. Rationalisation has tended to merge some of them but there are still three strong contenders for world market leadership: RM, SQ and CD-4.

While the hifi industry in the USA has been deeply involved, much of the action has been concentrated in Japan. Determined not to be out-manoeuvred in the home and export markets, virtually all the big-name manufacturers in Japan had been working quietly on the four-channel concept and had systems ready to launch when the time came.

Because they were developed behind closed doors, the systems were notable for their variety and for the names by which they were called. Not surprisingly, the impact on the marketplace was one of confusion and the natural buyer impulse was to hold off until the situation had been sorted out.

Realising this, some forty audio equipment and components makers affiliated with the Electronic Industries Association of Japan met during mid 1971 in an effort to determine mutually acceptable standards.

Committees were set up to examine the various methods but their deliberations were subjected to a variety of pressures. A majority decision in November 1971 was challenged so strongly that the matter was turned over to the Japan Record Association for a second opinion. But the JRA, allegedly piqued because it had not been consulted sooner, chose not to make an instant decision, on the grounds that any such decision would be premature.

However, despite their individual reluctance and individual commitments, Japanese manufacturers realised that the position had to be rationalised if the potential four-channel market was to be exploited successfully. A further industry conference in March of this year at least served to reduce the field to three basic contenders — still too many for comfort but not too many to accommodate on an amplifier mode switch, if that had to be done.

The conference confirmed what had been indicated by various other evaluations, namely that most of the matrix systems could merge their identity into one basic configuration, without their promoters losing face. They could retain their own gimmick names for four-channel equipment, and could apply their own initiatives to certain aspects of encoding and decoding, while still preserving a common approach.

Any program material conforming to this basic encoding concept would be reproduced adequately on any equipment, irrespective of maker, with only second-order differences.

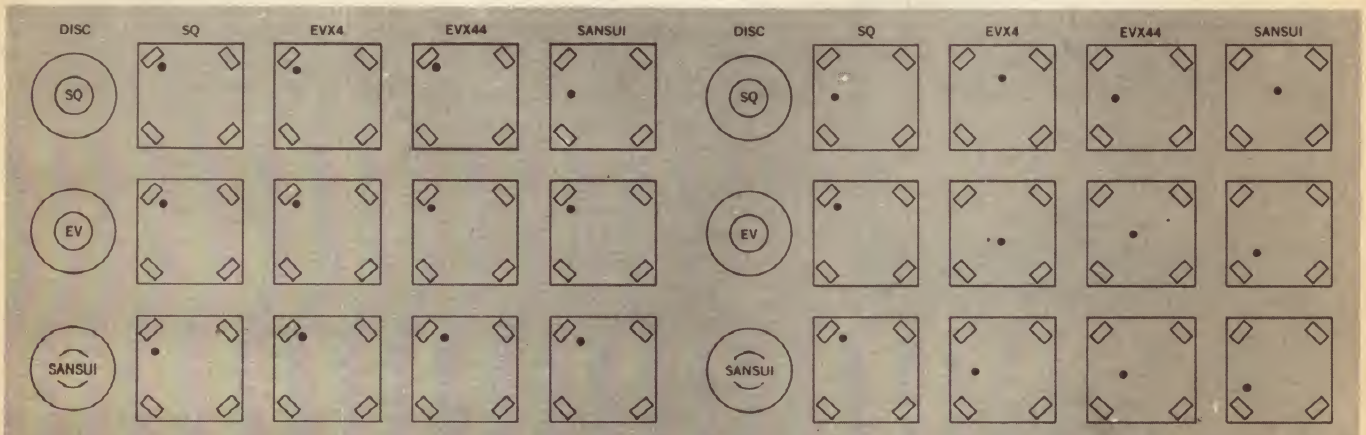
The systems which can be so merged (or are being merged) have been grouped under the omnibus title of "regular matrix", abbreviated to "RM". An increasing amount of Japanese four-channel equipment is therefore likely to be encountered with an RM position on the mode switch intended to cope with all matrix systems not otherwise specifically mentioned.

The one well known matrix system that cannot be readily adapted to the RM configuration is that adopted in Japan by Sony and in the USA by CBS. Nor does there seem to be any likelihood, at this stage, that either of these companies will forgo the system to conform to the regular matrix configuration.

But, if the CBS / Sony system cannot be adapted or surrendered, it equally cannot be ignored. As a result, many of the major Japanese manufacturers are electing to provide an in-built SQ (Sony) decode matrix, along with the RM decode matrix.

The "Discrete" system, involving modulated supersonic carriers and sponsored by JVC / Nivico and RCA, is radically different from any of the matrix systems.

Because it calls for a special pickup and a unique FM demodulator, few manufacturers seemed inclined at present to build in discrete decoding. The present trend seems rather to wire the mode switch so that, in the "discrete" position, the amplifier is switched to four external inputs. If the user want to play CD-4 discs, he is expected to provide an external CD-4 decoder.



There are various versions of the matrix system, but are discs and equipment compatible? Howard Durbin, of Electro-Voice, USA, conducted a series of tests, using discs from three companies and equipment from four companies. These diagrams summarise the power distribution of the various systems when a signal is applied to the left front. The dot shows the apparent source.

This set of diagrams shows the apparent source when power is applied to the left rear, using the same discs and equipment as previously. The results show plainly that the systems are not fully compatible. We are indebted to Howard Durbin and Audio Magazine, USA, for the information contained in these diagrams.

This would appear to constitute a severe disadvantage for the sponsors of the system but their promotion is built around the claim that the CD-4 system is the only one which can offer completely independent signals from each channel; that the others can never be more than a compromise, a half-way house!

In the United States the controversy between the various systems is characterised by a fair amount of heat, as was plainly evident at the last AES (Audio Engineering Society) convention.

US industry confrontations have tended to be on the basis of discrete versus the rest. Even though the matrix camp is divided, they manage to find common cause in defending an approach which they claim to be successful, compatible and undemanding in terms of current technology.

It is of no great consequence if a manufacturer has to provide a mode switch and two or more decode matrixes. The proposition is far simpler than an entirely new cartridge, a new preamplifier and an FM demodulator.

The case for matrix is being strengthened by the evolution of "logic" circuits which further process the signals when they emerge from the decode matrix.

The processing takes a variety of forms but, in the elemental sense, it amounts to volume expansion operating in one mode or another. Strong signals may be boosted; weak signals may be attenuated; a dominant signal in one channel may be used to desensitise the other three channels.

Sponsors of the various systems no longer seek to excuse the one-time quoted figure of 3dB for separation between certain channels. They are crossing it out and substituting 10dB, 15dB and as much as 20dB.

Who needs discrete, they say, when you can get 20dB separation from a matrix?

This is part of the united front.

What rather spoils the picture are assurances by the sponsors of some systems that their's is free of the limitations of others — marginal distortion, suppression of wanted low-level music information, noticeable time constants. These are all areas of suspicion attaching to dynamic signal processing, at least of the more elementary kind.

But, details aside, the situation in the United States is being interpreted as yet another confrontation between CBS and RCA, with CBS as the champion of matrix and RCA the champion of discrete. Rationalisation must therefore involve a "political" as well as a technical compromise.

It has been suggested, in fact, that compromise need not be as elusive or as bitter as might at first appear.

With the discrete system it is necessary to matrix (or combine) the four signals in particular combinations before they are variously applied as direct audio drive to the cutter and as a modulation to the FM carrier which is also inscribed in the groove.

At present, the direct audio signal is a simple additive mix such that the major pattern on the respective walls of the groove is "left" signal on one side and "right" signal on the other.

This provides complete compatibility with existing systems in that a two-channel unit will reproduce a straightforward two-channel signal, while a mono unit would reproduce a straightforward mono signal, free from artificially induced phase or cancellation effects.

Four-channel reproduction, of course, involves resolution of the difference signal on the FM carrier and matrixing to isolate the four discrete components.

It has been pointed out, however, that the discrete system could fairly easily be modified so that the basic audio drive to the cutter could contain elements of all four signals, matrixed in line with either RM or SQ practice.

The FM carrier would accommodate a complementary signal which could be recombined with the direct signal to recover the original discrete components.

The algebra would be a little more complex than at present, and stereo / mono compatibility would suffer slightly, in common with the pure matrix systems. However, the discrete system, thus modified, would provide the basis for a new and promising format.

All that would remain would be to merge the remaining matrix strongholds, RM and SQ, into one to make possible a universal RM-SQ-CD4 composite. The resulting disc would then be playable in any mode and could involve whatever degree of equipment sophistication the buyer chose to pay for.

Ordinary mono and stereo players would simply respond to the main groove modulation, recovering a signal similar to that recovered from existing matrix records. The FM carrier would be ignored.

Four-channel equipment with in-built matrix would also ignore the FM carrier. However, it would decode the basic groove modulation to produce the same kind of four-channel output as from any existing matrixed record.

Premium quality equipment could be expected to have a full-scale demodulator / decoder inbuilt, and be used with a pickup having appropriate frequency and compliance characteristics. The full content of the groove would be recovered and processed to produce the original four discrete signals.

Undoubtedly the possibility of compatible matrixing would have been considered by JVC / RCA engineers but, even as late as now, the matrix situation is still so confused that compatibility can only be considered in non-specific terms.

In the face of current pressures, however, the exponents of the matrix system might just come to terms with a single basic configuration. RCA / JVC might just be induced to adopt such a matrix for their basic groove modulation. And, of course, others might see their way clear to add the FM carrier necessary for full-scale discrete.

But then again, they might all determine to go their own separate ways.

It's a "mighty" problem!

And in Australia

Although there has been a certain amount of "spillover" from the American and Japanese markets, four-channel sound is not yet an established part of the hi-fi scene in Australia.

Some suppliers of audio equipment have demonstrated four-channel equipment made by their overseas principals, mainly using the stereo compatible matrix system. However, there has not as yet been any consistent attempt to promote the equipment. The attitude seems to be, we have the equipment available if anybody particularly wants it, but for the moment, we will wait and see what happens overseas.

Disc manufacturers have released a limited number of records and here again most of these have been matrix system, which can be played on existing stereo systems. However, it is probably true to say that a purchaser of a full scale four-channel sound system would find his repertoire of available recordings severely limited at present, and there are no indications that this state of affairs will change in the near future.

1972 Faraday lectures — additional dates & booking addresses

Free tickets to the remaining 1972 Faraday lectures may be obtained by writing to or telephoning the following IREE representatives:

For Canberra on 13 Sept: Hon Sec K. B. Flynn, PO Box 1246, Canberra City, ACT 2601.

For Wollongong 15 Sept, Newcastle 18 Sept, and Sydney 20, 21 and 22 Sept: Inst of Radio and Electronics Engineers, Science House, 157 Gloucester St, Sydney 2000. Telephone 27-1039.

For Brisbane on 25, 26 and 27 Sept: Hon Sec L. Blagbrough, Box 1765 GPO, Brisbane 4001. Telephone 70-7198.

For Townsville on 4 Oct: Mr John Richards, C/o Dept of Electrical Engineering, James Cook University of North Queensland, PO Box 999, Townsville 4810. Telephone. 79-3711.

For Launceston 18 Oct: Mr G. Nichols, Hon Sec IREE, Launceston Branch, 91 Wellington St, Launceston. Telephone 2-5883.

For Hobart on 23 and 24 Oct: Hon Sec IREE, Hobart Division, Mr M. M. Welch. Telephone 30-4489.

For Perth 8 and 11 Nov (11 tentative): Hon Sec IREE, Perth Division, Mr C. H. Fletcher. Telephone 64-3347.

As mentioned in last month's news columns, this year's lecture is a unique multi-projector audio visual presentation.

Build this Utility-PA Amplifier at low cost: Special Offer!

Here's a handy little utility amplifier ideally suited for a small PA system. It's the first of a series of audio projects which feature a new power amplifier module using Fairchild's new "bimesar" silicon power transistors. And you will be able to obtain the complete kit of transistors for the power module from Fairchild Australia Pty Ltd at a special low price!

by GEORGE HUGHES and JAMIESON ROWE

When we were gathering the information together for our news story in the May issue (p.17) announcing Fairchild Australia's new range of "bimesar" silicon power transistors, we were particularly impressed by the tremendous electrical ruggedness of the bimesar devices. The dual epitaxial collector / epitaxial base construction used for the devices makes them very tolerant of transients and short-term overloads, even of quite gross proportions.

The devices are in fact so rugged that they can be quite adequately protected from damage by a normal fast-acting fuse. This coupled with the simpler heat sinking made possible by their 200°C junction temperature rating makes them very suitable for use in audio power amplifiers.

We were so impressed with the suitability of the devices for audio use that we began to look into the idea of using them to produce a flexible and multi-purpose "building brick" power amplifier module, one that could be used singly for mono applications, or in combinations for stereo and perhaps quadraphonic systems. Our work along these lines was spurred by applications data which Fairchild themselves published shortly after our news story.

To cut a long explanation short, we have now developed the power amplifier module, which is based on one of Fairchild's application designs. The little utility amplifier described in this article is the first project using it, and will be followed in later issues by other projects.

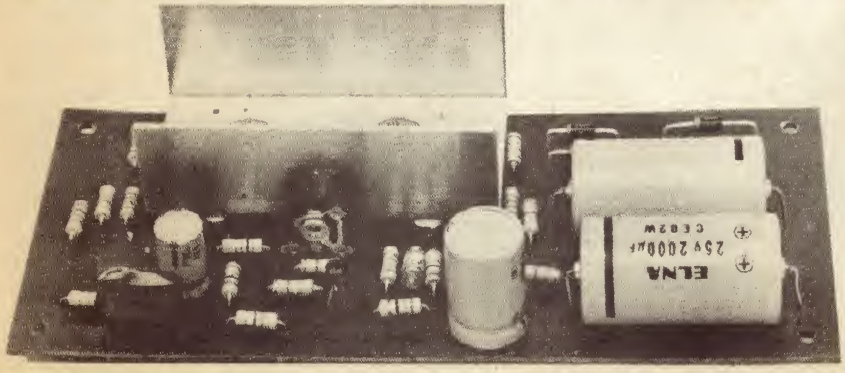
As a special offer to assist E-A readers in building this project and those which will follow, Fairchild Australia is undertaking to supply complete kits of the transistors used in the basic power amplifier module, at a special low price. There are seven transistors in the module, including the two bimesar output transistors, and together these would normally cost about $6. By filling in the special offer coupon provided in this article, you will be able to obtain the kit for $3.50. This figure includes postage, packing and sales tax.

The coupon and remittance should be posted to Fairchild's office in Victoria, at PO Box 151, Croydon 3136.

The offer also extends to readers in New Zealand, who should send the coupon to Fairchild New Zealand (Limited), at 1 Gordon Road, Otahuhu. Unfortunately it will be necessary to charge New Zealand readers a further 50c per kit to cover the cost of import duty, but the resulting kit price of $4.00 will still represent a considerable saving.

New Zealand readers will also be able to obtain the kits at the special price of $4.00 from John Gilbert, Anzac Avenue, Auckland; or from Tisco N.Z. Ltd at PO Box 102, Wellington; PO Box 823, Hastings; PO Box 1145, Hamilton; PO Box 2006, Dunedin; PO Box 1712, Christchurch; and PO Box 1355, Palmerston North. The above suppliers will also have a printed wiring board available for the module, at $1.20.

Please note that Fairchild Australia and Fairchild New Zealand will only be able to supply kits at the special offer prices when the orders are made via the order coupon printed in this and following articles in "Electronics Australia". Fairchild cannot undertake to enter into any technical correspondence regarding the kits, and will not be able to supply kits at prices lower than the specified offer prices to individuals or organisations exempt from sales tax. The kits will not be available from "Electronics Australia" offices.



A close-up shot of the new power amplifier module using "bimesar" output transistors. The wiring board measures 6¾ in x 3in (172 x 77mm).

SPECIFICATION

Output 12 watts RMS into 8 ohms, for less than 0.8% THD.
Output 9 watts RMS into 15 ohms, for less than 0.5% THD.
Frequency response 30Hz — 17kHz, power bandwidth the same.
Signal to noise ratio: 56dB auxiliary input, 54dB mic input.
Output impedance approximately 0.1 ohms.
Mic input 5mV at 50k impedance.
Auxiliary input 80mV at greater than 1M impedance.

As may be seen from the circuit diagram, the new audio module consists of a complete silicon power amplifier, together with all of the necessary power supply components and wiring except the mains transformer. All of the module components, including the output transistors and their heatsink, are mounted on a printed wiring board measuring 6¾in x 3in (172 x 77mm). The code number for the board pattern is 72 / sa9, and boards should be available shortly from the usual suppliers.

The power amplifier used in the module features a rather novel circuit configuration. Complementary NPN and PNP transistors are used in both the output and driven stages, with a centre-tapped power supply to allow direct coupling to the loudspeaker voice coil. But in contrast with the usual arrangement where the output transistors and drivers are both connected in the emitter-follower configuration, they are here connected in common emitter mode.

A worthwhile advantage of this configuration is that it allows the two output transistor collectors to be directly connected to a common heatsink. The substantially constant-current biasing for the output transistors also enables full advantage to be taken of the 200°C junction temperature rating of the bimesar output

The circuit for the complete utility / PA amplifier. The new power module circuitry is enclosed in a dashed rectangle.

devices. With the usual configuration, the large drop in Vbe at elevated temperatures would tend to result in thermal runaway.

The net result of these advantages as far as the builder is concerned is that, although the module uses only a pair of small TO-66 power transistors in the output circuit, mounted on a heatsink measuring only 3in x 1½in x 1in, it is capable of delivering no less than 17 watts RMS into 8 ohms, or 10 watts into 15 ohms. These figures are not achieved in the present project, where the output is limited to lower levels due to power transformer regulation, but they may be achieved using a larger power transformer.

The quiescent current level in the output transistors is determined by a 2N3565 transistor connected as an "amplified diode" between the bases of the two driver transistors. Both the driver transistors and this biasing transistor are thermally coupled to the output transistors' heatsink, to ensure good thermal stability. The driver transistors are driven by a high-gain PNP transistor used as a pre-driver, with a 390pF capacitor between collector and base to control phase shifts within the amplifier loop.

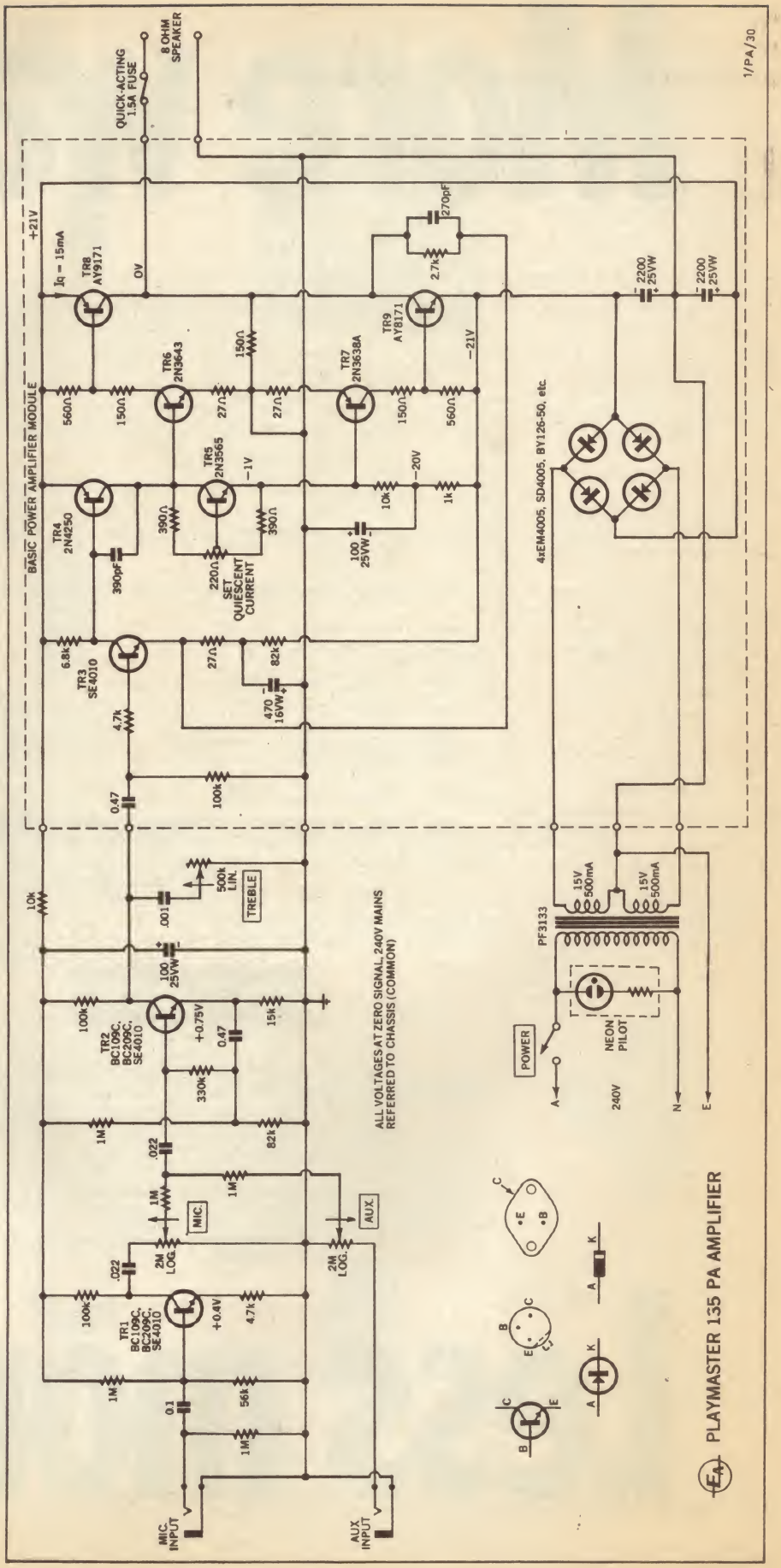
In turn the pre-driver stage is driven by an input amplifier using an SE4010 low-noise transistor. Negative feedback is taken from the output of the amplifier back to the emitter of the input stage to stabilise the gain and frequency response, and reduce noise and distortion.

The negative feedback is also used to firmly fix the quiescent voltage at the output of the amplifier at earth potential, so that the loudspeaker is not damaged by DC flow. The base of the input stage is connected to earth, while the current through the 82k series emitter resistor is chosen such that there is an approximately 0.6V drop in the 2.7k feedback resistor which compensates for the 0.6V base-emitter voltage of the input transistor. The input transistor thus effectively compares the output quiescent voltage with the earth potential established at its base, and adjusts the current fed to the pre-driver, driver and output stages to maintain the two equal.

The basic module has a voltage gain of approximately 100 times, established by the ratio of the 2.7k feedback resistor and the 27 ohm resistor in the emitter of the input stage. Input sensitivity is thus approximately 200mV RMS for full output, with an input impedance of 100k. Frequency response is 3dB down at 12Hz and 100kHz, and the power bandwidth is virtually the same. Output impedance is approximately 0.1 ohm, giving a nominal damping factor of 80 with 8-ohm loudspeaker and 150 with 15-ohm loudspeakers.

As one would expect from the frequency response, the square wave response is very good. Stability is also good: up to 0.2uF may be connected across the output before significant ringing occurs, and up to at least 2uF before instability is produced.

Power supply for the module is provided by a rectifier bridge using four 1A silicon diodes, together with two 2200uF reservoir capacitors. The rectifier is used with a centre-tapped 30V transformer winding to give positive and negative 19V outputs, with the common line earthed.



More watts.

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Max. Power T.C.25°C	Product	Polarity	Package	LV_{CEO}	V_{CE} Sat	h_{FE}
115 W	2N3055	NPN	TO3	60	1.1 V @ 4 Amp	20-70 @ 4 Amp/4 V
115 W	AY8149	NPN	TO3	60	1.1 V @ 4 Amp	20-150 @ 4 Amp/4 V
115 W	AY9149	PNP	TO3	−60	1.1 V @ 4 Amp	20-150 @ 4 Amp/4 V
115 W	AY8150	NPN	TO3	40	1.1 V @ 4 Amp	20-150 @ 4 Amp/4 V
115 W	AY9150	PNP	TO3	−40	1.1 V @ 4 Amp	20-150 @ 4 Amp/4 V
35 W	AY8170	NPN	TO66	40	1.5 V @ 3 Amp	Typ. 30 @ 3 Amp/4 V
35 W	AY9170	PNP	TO66	−40	1.5 V @ 3 Amp	Typ. 20 @ 3 Amp/4 V
35 W	AY8171	NPN	TO66	60	1.5 V @ 3 Amp	Typ. 30 @ 3 Amp/4 V
35 W	AY9171	PNP	TO66	−60	1.5 V @ 3 Amp	Typ. 20 @ 3 Amp/4 V
25 W	2N3054	NPN	TO66	55	1 V @ ½ Amp	25-100 @ 2 Amp/4 V
10 W	AY8139	NPN	TO5	40	.6 V @ 1 Amp	Typ 45 @ 1 Amp/2 V
10 W	AY9139	PNP	TO5	−40	.6 V @ 1 Amp	Typ 35 @ 1 Amp/2 V
10 W	AY8140	NPN	TO5	60	.6 V @ 1 Amp	Typ 45 @ 1 Amp/2 V
10 W	AY9140	PNP	TO5	−60	.6 V @ 1 Amp	Typ 35 @ 1 Amp/2 V

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FC 5128 A

We have provided the module with its own on-board rectifier bridge and reservoir capacitors to simplify multiple usage. This way, the only change needed to use the modules in pairs for stereo or in a group of four for quadraphonic work is to select a transformer of the appropriate rating. Thus we have used a Ferguson type PF3133 for this mono amplifier, but one would use the A & R type PT6672 or a similar unit for stereo, etc. For multiple use, the fact that each module will have its own reservoir capacitors should keep channel cross-talk to a very low level, despite the simple power supply circuitry.

With the power transformer specified above, the module is able to deliver an output of 12W into an 8-ohm load for less than 0.9% total harmonic distortion, and 9W into a 15-ohm load for less than 0.5% distortion. As noted earlier, these figures are determined mainly by the power transformer regulation, the module itself being capable of somewhat higher output with a larger transformer.

For the present project we have added further input circuitry to the basic module to turn it into a mono utility amplifier suitable for small PA and paging systems, record playing, and similar applications.

An amplifier-impedance matching stage is fitted directly ahead of the module input. This is preceded by a simple mixing circuit and a mic preamp stage, so that the complete circuit can accept signals from both a crystal-ceramic pickup and a dynamic mic, and can mix between them.

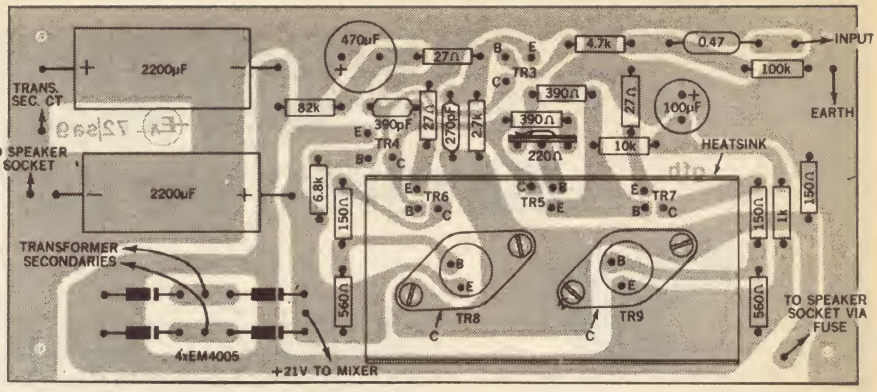
Input sensitivity of the pickup input is approximately 80mV RMS for full output, which should cope with even the lowest output ceramic cartridges. Input impedance is above 1M, which should ensure quite good bass response. Note that this input of the unit is marked "auxiliary" as it would be equally suitable for signals from radio tuners, tape recorders and other sources.

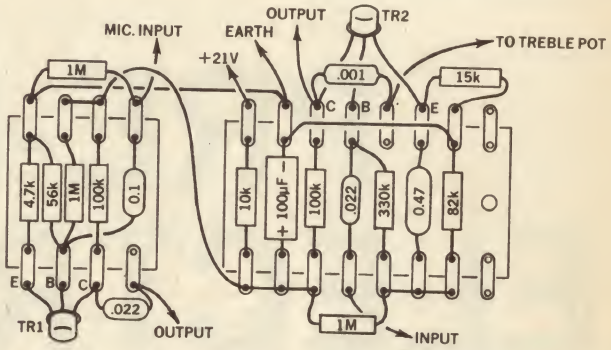
The input sensitivity of the mic input is approximately 5mV RMS for full output, which should cope with most dynamic mics. Input impedance is approximately 50k.

Both the mixing amplifier and the mic preamp stages use low-noise NPN transistors such as the SE4010, BC209C or BC109C. A treble-cut tone control is wired across the output of the mixing amplifier to allow the response to be rolled off if desired.

Frequency response of the complete amplifier is 3dB down at 30Hz and 17kHz, and the power bandwidth is the same. Signal to noise ratio is 56dB for the auxiliary input, and 54dB for the mic input.

The completed amplifier is housed in a case virtually identical with that used for the "10-plus-10" amplifier of November 1968 and April 1969, except that fewer holes are used on the rear panel. A different front panel escutcheon will be required, of course, and we will be making negatives of the panel available via the Information Service at a cost of $1.00 each.





At top is a diagram to aid in wiring the module printed board, while immediately above are the two smaller wiring panels.

The main amplifier module of the unit is mounted on the baseplate of the case, at the rear alongside the power transformer. The mixing amplifier, control wiring and mic preamp are mounted near the front of the baseplate, with a tinplate shield covering them to obviate hum induction.

The mic preamp stage is mounted on a 4-lug-long section of miniature resistor panel, while the mixing amplifier is on an 8-lug-long section of the same panel. A small 2-lug tagstrip is used to anchor the tie point of the 1M mixing resistors.

Wiring the amplifier module on the printed board should present few problems even for the tyro, as we have prepared a wiring diagram to guide in placing all the parts and making all the connections. There are similar diagrams to assist in wiring up the two input stages.

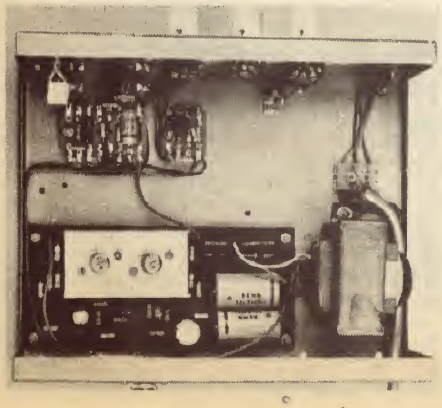
Don't be surprised if when you buy the printed wiring board for this project, you are actually sold a combination board with two identical patterns side-by-side. We are in fact recommending this to board manufacturers in order to lower the cost of later stereo projects using the module. For this project it is a simple matter to cut the board in half with a hacksaw, giving you a spare board for some other project.

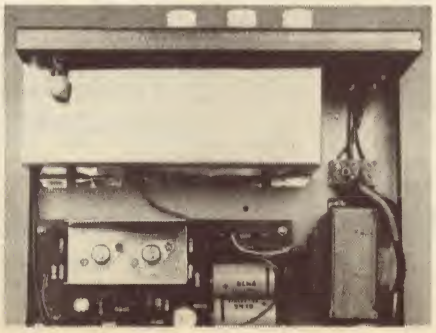
Probably the best place to start when assembling the amplifier is the module itself.

First mount all of the minor components on the board except the bias transistor and the two driver transistors, carefully checking to make sure that you have each component in the correct position and correctly orientated before you solder its connections.

Then mount the power transistors on the heatsink, using a little silicone grease under them for maximum heat transfer. Tighten them initially with the fingers, using ⅛in Whit brass countersunk screws with 3/16in long tapped brass spacers as nuts. You will find that the countersunk heads of the screws tend to locate the transistors on the heatsink correctly in relation to the pin holes. Tighten them firmly with a suitable tool.

The bias transistor and the two driver transistors are all mounted under the heatsink when it is attached to the board, with their rounded plastic "glob-tops" resting in dimples in the underside of the heatsink formed with a large-diameter drill. Before attaching the power transistors





At left and above are views of the amplifier, with and without shield.

and their heatsink the three small transistors are placed in position on the board, but not soldered. Place a small dob of silicone grease on the top of each to ensure a good thermal bond to the heatsink when it is over them. Then add the heatsink, fastening it into position with four brass nuts on the foil side of the board.

Then, working again from the foil side of the board, push each of the three small transistors into the dimples of the heatsink and solder its leads to the appropriate foil pads. Finally the power transistor pins can also be soldered.

Make up the preamplifier sections, and mount these in position, using a nut as a spacer at the underside of the tagboard. Other components such as the main board, power transformer, input and output receptacles, potentiometers, power switch and bezel can now be mounted and interconnected.

Then if everything seems in order, connect an 8-ohm or 15-ohm loudspeaker to the output. Set the bias current preset pot on the module board to mid position, plug the power lead into a 240V outlet, and switch on. If the amplifier is in proper DC balance, you will simply hear a small "thump" in the speaker, followed by a continuous but barely audible hiss. You may have to listen closely with your ear to the speaker to hear this.

A finger on each input in turn with the volume controls at mid position should produce some kind of hum, indicating that the preamplifier and amplifier circuits are active.

The quiescent current of the driver and output stages may need some adjustment to remove crossover distortion. If there seems to be an edginess in the amplifier's output, particularly at low levels, the current should be increased by turning the preset pot slowly clockwise as viewed from the front of the board. Turn the pot just far enough to remove the distortion, and leave it at that. If the quiescent current is increased too far, the power transistors will run at a needlessly high temperature.

If you want to check the actual quiescent current, the best way to do this is to cut the positive supply conductor on the board, and connect a current meter into circuit. The conductor should be cut carefully with a razor blade, where it runs around the heatsink mounting nut nearest the rectifier diodes and just near the 5.6k resistor. The current flowing here should be approximately 15 milliamps for no signal.

Don't forget to re-join the conductor after this check, by running solder generously across the cut for the full width of the copper.

To assist readers in troubleshooting, we have indicated typical values for voltages in the amplifier circuit, and readers equipped with a 20,000 ohm / volt meter should have no trouble in locating any troubles that may occur. It must be remembered that readings cannot be taken in some parts of the preamplifier stages using such a meter. This is because the meter's internal resistance will modify the voltages due to loading. However the voltages nominated are indicative that everything is operating properly.

YOU'LL NEED THESE COMPONENTS:

1 Metal case and front panel (see text).
1 Printed wiring board, code 72 / sa9.
1 Power transformer, 240V to 30V CT at 500mA.
1 SPST miniature toggle switch.
1 Neon indicator bezel (240V).
1 Miniature fuse holder and 1.5A fast-acting fuse.
2 Phone jack sockets
1 Polarised 2-pin socket with plug for speaker.

SEMICONDUCTORS
1 Fairchild silicon power kit, comprising one each AY8171, AY9171, 2N3643, 2N3838A, 2N3565, and SE4010. transistors.
2 SE4010, BC209C, BC109C or similar low noise NPN transistor.
4 BY126-50, EM4005, SD4005 or similar 1A / 50V silicon diode.

RESISTORS
Half watt, 5%: 3 x 27 ohm, 3 x 150 ohm, 2 x 390 ohm, 2 x 560 ohm, 1 x 1k, 1 x 2.7k, 2 x 4.7k, 1 x 6.8k, 2 x 10k, 1 x 15k, 1 x 56k, 2 x 82k, 3 x 100k, 1 x 330k, 5 x 1M.
1 220 ohm tab pot (board mounting).
1 500k carbon pot
2 2M log carbon pots.

CAPACITORS
2 2200uF 25V electrolytic
1 470uF 16V single-ended electrolytic
1 100uF 16V single-ended electrolytic
1 100uF 25V electrolytic
2 0.47uF 100V polyester.
1 0.1uF 100V polyester.
2 .022uF 100v polyester.
1 390pF polystyrene.
1 270pF polystyrene.

MISCELLANEOUS
4 ⅛whit x ⅝in c'sunk brass screws, 3 control knobs, 4 ⅛whit x 3/16in threaded brass spacers, rubber feet, grommet for power lead-in, length power lead and power plug, 4-lug-long and 8-lug-long sections of miniature resisted panel, scrap aluminium for heatsink, sundry mounting screws and nuts, hookup wire, etc.

Note: Resistor wattage ratings and capacitor voltage ratings are those used in the prototype. Components with higher ratings may generally be used, providing they are physically compatible. Components with lower ratings may be used in some cases, providing the ratings are not exceeded.

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USES: LPS Instant Cold Galvanize should be used wherever metal is exposed to corrosive conditions such as in the construction and maintenance of:

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MINING EQUIPMENT	SNOWMOBILES	LINES & TOWERS
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TECHNICAL INFORMATION:

Passes PREECE TEST for hot-dip galvanizing
SINGLE APPLICATION THICKNESS – approximately 1½ mils
COVERAGE – approximately 50 square feet per pound

TOUCH DRY – 1 minute . . . can be painted over in 6 hours or 30 minutes after baking at 350° for 15 minutes

WITHSTANDS:

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- Continuous dry heat up to 750° F.
- Short period heat up to 1000° F.

SPECIFICATIONS:

LPS Instant Cold Galvanize meets or exceeds the following specifications:

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MIL - P - 21035 Galvanizing repair (U.S. Navy)
MIL - P - 26915A for steel (U.S. Air Force)
MIL - T - 26433 for towers (Temperate and Arctic Zones) (U.S. Air Force)

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Novel Power Supply is also a Series Modulator

Not merely a power supply and a modulator in the one box, but a variable and regulated supply which also performs the function of a transformerless series modulator. Using a novel hybrid circuit technique which combines valves and transistors, it should be of equal interest to both the experienced amateur and the newcomer to amateur radio.

by JAMIESON ROWE

A few weeks ago, I built a small "outboard final" designed to boost the RF output from my existing 144MHz AM transmitter. Rather than make the new final a linear amplifier, I elected to make it a class-C stage in order to obtain the full output for which the valve is rated. This naturally meant that the modulation would have to be disabled in the basic transmitter, and modulation applied to the new final instead to ensure good linearity.

I had planned to supply both modulation and power for the new final from a heavy-duty power supply and class-B modulator unit which had been used for an earlier transmitter. However when I switched this unit on to check that it still worked, I soon found that it was not going to be as easy as I had planned. Among other things, the modulation transformer appeared to have an intermittent short-circuit from secondary to frame. . .

Not having an assortment of modulation transformers from which to choose a replacement, this possiblity was ruled out. And an enquiry regarding new transformers of the appropriate type and rating soon ruled out that possibility also — if only on the score of cost. There didn't even seem to be a suitable old power transformer which I could press into service, either.

With transformer modulation thus fairly definitely ruled out, my thoughts first turned to screen grid modulation. This could certainly be achieved quite easily without a transformer, and with very low power. The easiest way would be to use a voltage amplifier followed by a cathode follower, with the cathode of the follower feeding directly into the PA valve screen as its load.

Unfortunately there is one drawback which this method shares with the other types of "efficiency modulation" — reduced power output. In order to remain within the PA valve ratings, the zero-modulation output must generally be less than the equivalent output for conventional plate modulation. Screen modulation therefore offered little real advantage over the linear amplifier approach, in terms of actual RF (power) output.

Front view of the completed prototype unit. The two meters were salvaged from junked test instruments, but are quite satisfactory.

By a process of elimination I was thus led to consider series modulation. Why not take the idea of screen modulation with a cathode follower a step further? Use a high-power valve or valves in the cathode follower stage, and use it to modulate the supply to both the plate and screen of the PA. With a basic power supply voltage of approximately twice that normally fed to the PA for zero modulation, one should be able to get as much output, within ratings, as with conventional transformer modulation.

Almost immediately after I began working on a design based on this approach, I was struck by the similarity between the circuit I was developing and that of a regulated variable power supply. In fact the logical move was to deliberately combine the two concepts, and design the unit as a regulated variable supply which was also a modulator.

Hence the idea for this project was born. It may not be a completely new design concept, but it is at least original as far as I am concerned.

Before describing the unit itself, I should perhaps give a brief specification of its performance.

The unit as described has two separate HT outputs: a variable, regulated output which may also be modulated with an audio signal, and a fixed voltage output which is unregulated and unmodulated.

The regulated output is variable between approximately 140 and 300V, to suit a variety of possible transmitter requirements. Its regulation is very good, as may be seen from the curves. Expressed as a percentage, it is better than 0.3% even for current drains well above the limits set by regulator valve dissipation. Ripple output is also very low.

This output may be modulated to approximately 90% by feeding an audio signal of 60mV or more into the "AF input" of the unit. The frequency response of the modulation circuitry is 3dB down at 100Hz and 5kHz, which is more than adequate for amateur and other communications work. Because of the high degree of negative feedback around the modulation circuitry, the modulation is very linear and has low distortion.

As with other series modulators, the unit cannot overmodulate a transmitter in the classic manner possible with transformer modulation. The output voltage can never swing negative on negative modulation peaks, so that a transmitter connected to its output is never cut off. This means that even gross overmodulation (accidental, hopefully!) cannot result in "splatter" of the classical type.

In fact the output from the modulation circuitry of the unit cannot even fall entirely to zero on negative modulation peaks, due to

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The circuit of the unit, which is both a power supply and a modulator.

saturation effects. This admittedly means that the transmitter cannot be 100% modulated; but on the other hand it will always deliver at least some RF carrier even during gross overmodulation.

All that happens with overmodulation is that saturation effects cause the modulation waveform to become flattened on either positive or negative peaks — or both — depending upon the quiescent output voltage level.

Naturally this distortion generates additional sidebands on each side of the RF carrier, corresponding to harmonics of the modulating signal. However these are generally not nearly as objectionable as the wideband products generated by splatter transients.

The current capability of the HT regulator / modulator, which is limited by valve dissipation, is approximately 120mA. At 280V output this corresponds to 33W input to a transmitter, so that when used for plate modulation the unit is suitable for use with transmitters of up to about 30W input rating. But there is really no reason why you shouldn't use it as a screen modulator, for higher power transmitters. By using the unregulated HT output to run the PA stage plate and earlier stages, and the regulated / modulated output to run the screen, it could be used with transmitters running up to about 60W input.

The unregulated HT output from the unit is intended for supplying power to either the earlier stages of a valve transmitter, or to the PA stage plate of a higher-powered transmitter when the modulated output is used for screen modulation. This output is approximately 320V for no load, and although unregulated it drops by only about 20V for a load of 175mA. As might be expected the ripple output is rather higher than from the regulated output, but additional filtering can easily be provided if desired, either in the unit itself or in the transmitter.

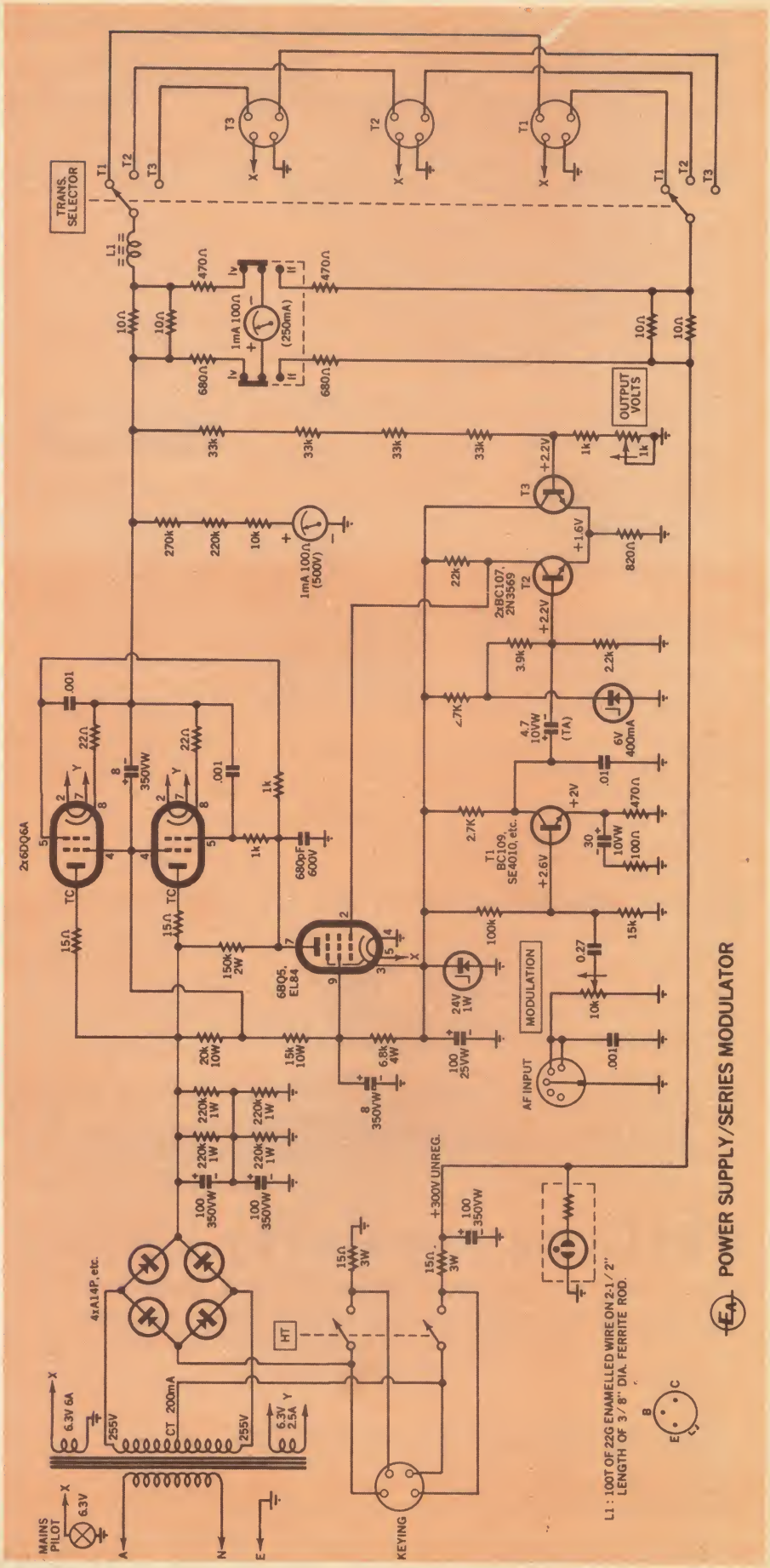
The unit is fitted with two meters, one of which is used as a voltmeter to monitor the output voltage from the regulator / modulator circuit. The other meter is switchable to measure the current drawn from either the regulated or unregulated outputs.

The two HT outputs from the unit may be fed to any one of three output sockets for connection to transmitters. Each socket is also supplied with 6.3V AC for valve heaters, etc.

For T-R switching the HT outputs of the unit are controlled by a front-panel toggle switch. The two contact sets of this switch are also brought out to a socket at the rear of the unit, to permit remote control from a console or control unit such as that which I described in the August issue.

The unit is quite straightforward in design, as may be seen from the main circuit diagram. It uses only three valves, three transistors, four rectifier diodes and two zener diodes, in a hybrid circuit which I believe is quite novel.

Perhaps the heart of the unit is the series-pass or cathode follower stage, which uses a pair of 6DQ6A horizontal output valves in parallel. These valves each have an 18W plate dissipation rating, so that together they provide a dissipation capability of 36W.



Small separate cathode resistors are used to ensure that they share the load current equally, to equalise the dissipation.

The cathode followers are driven by a 6BQ5 / EL84, which acts as a voltage amplifier. This is driven in turn by transistor T2, which acts as a voltage comparator.

The base of T2 is supplied with a reference voltage of approximately +2.2V, obtained by means of a resistive voltage divider across a 6V zener diode. Its emitter is supplied with a slightly lower voltage, approximately +1.6V, which is produced across the 820 ohm emitter by transistor T3. This transistor is an emitter follower, whose base is connected to a tap on a resistive voltage divider across the HT output of the 6DQ6A cathode followers. Hence the 1.6V at the emitter of T2 is derived from, and proportional to, the HT output voltage.

As the conduction of T2 is determined by the relative magnitude of the voltages at its base and emitter, it therefore effectively compares the two. And this comparison action ensures that the HT output of the 6DQ6A cathode followers is regulated — ie, that it remains substantially constant with loading and mains voltage variations.

If the HT output tends to rise, the voltage at the emitter of T2 also tends to rise, and T2 will accordingly tend to conduct less. Its collector voltage will rise slightly, reducing the bias on the 6BQ5 valve and hence allowing this valve to conduct more current. This will cause the valve plate voltage to fall slightly, reducing the grid voltage on the cathode followers. These valves will then reduce their conduction slightly, restoring the HT output to its original value.

Conversely, if the HT output tends to fall, the voltage at T2's emitter will also tend to fall, and T2 will therefore conduct more. This will increase the negative grid bias on the 6BQ5, reducing this valve's conduction. Its plate voltage and the HT output voltage will therefore rise slightly to again restore the status quo.

The HT voltage level at which this stabilisation action takes place depends upon the setting of the 1k pot in the base circuit of T3. By adjusting the divider ratio, the pot in effect varies the HT voltage level which corresponds to a level of +1.6V at the emitter of T2. Zero pot resistance gives a large divider ratio, and hence maximum HT output, while maximum resistance gives a smaller divider ratio and hence a lower output voltage. The 1k resistor in series with the pot is used to set the maximum division ratio, and hence the maximum HT level (here 300V).

If you were already familiar with regulated power supply circuits you will no doubt have realised already that as described so far the circuit is a fairly conventional regulator. The only difference is that it is hybrid, the reference voltage being derived from a zener diode instead of a gas-discharge tube, while the comparator uses transistors instead of a valve.

So far so good. But how do we arrange for the circuit to act as a modulator as well? The answer is surprisingly simple: by in effect superimposing our audio input on the zener-derived reference voltage. With its reference voltage varying up and down with the audio, the regulator circuit is forced to duplicate the variations on a larger scale at the HT output.

As you can see from the circuit, the audio input is fed to an amplifier transistor T1, via

a pot used to adjust the modulation level. From the collector of T1 it is coupled to the base of comparator transistor T2, via a low-leakage tantalum electrolytic capacitor. It's as simple as that, except for a few minor matters which will be discussed shortly.

Before dealing with some of the more subtle aspects of the design, I had better give a brief description of the basic transformer and rectifier circuit.

If we were building a conventional regulated supply, and not one to double as a modulator, the requirement for the basic rectifier circuit would simply be that it should deliver sufficient voltage at the full load current to make up for the voltage drop across the series regulator valves. Its output would thus need to be 400V or so for a regulator intended to deliver up to 300V.

Because the present circuit has to be able to function as a modulator as well as a regulator, its HT output should be able to swing up on positive modulation peaks to TWICE the maximum quiescent output. For a maximum output of 300V, this means that the regulator should be able to deliver voltage peaks of 600V, corresponding to 100% modulation. Naturally this requires that the basic rectifier circuit should deliver at least the same voltage, or ideally somewhat more to again allow for voltage drop in the series regulator valves — say 700V.

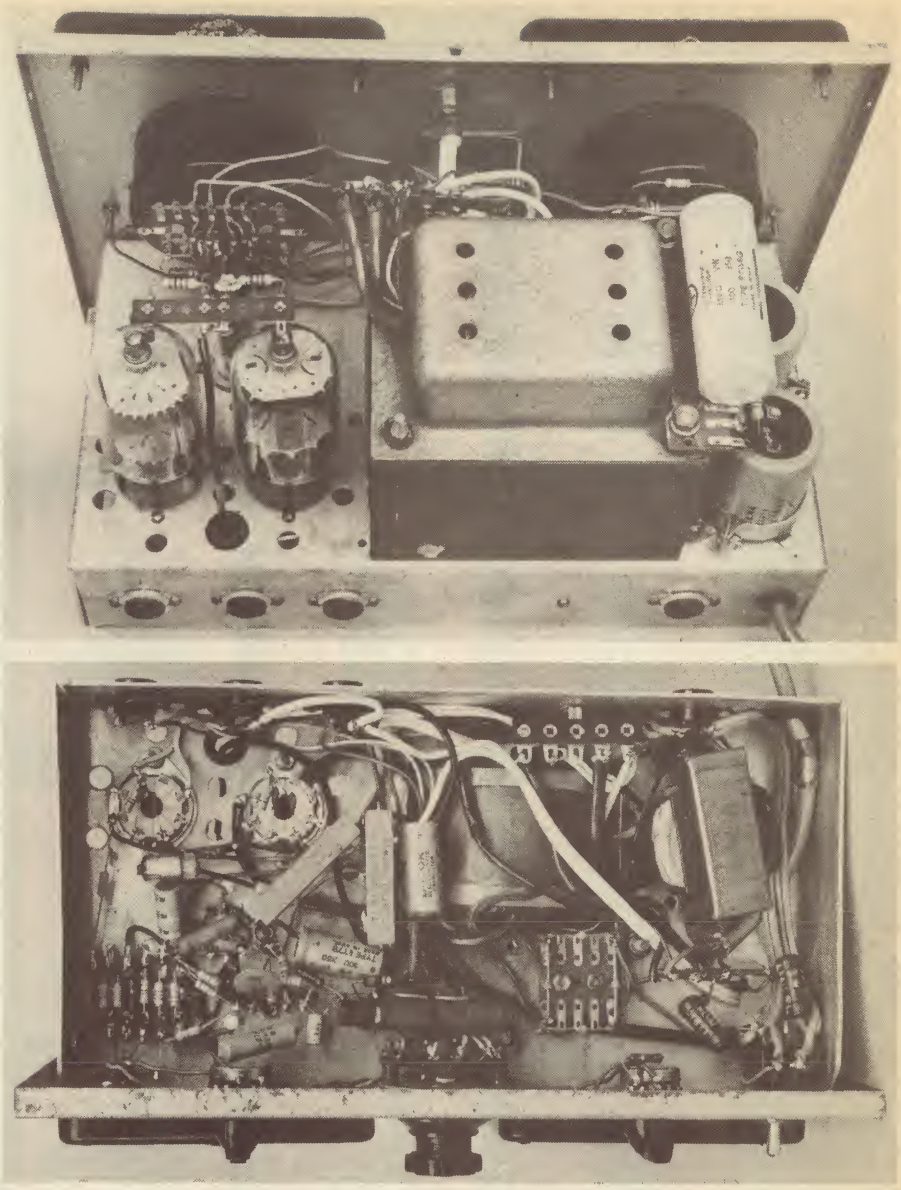
There are various ways of producing a voltage of this order, many of them involving exotic and costly power transformers. However I elected to use a simple approach, and one which uses a straightforward power transformer of the type having a centre-tapped HT secondary made for a conventional full-wave rectifier. By wiring a four-diode bridge rectifier right across the full winding, instead of the two normal diodes, the circuit gives twice the normal output voltage. At the same time the existing centre-tap may be used to provide the unregulated HT output.

The transformer I used in the prototype unit was taken from an old Pye-Tecnico 17-inch TV receiver. It was originally made for Pye by Ferguson Transformers Pty Ltd, and coded PF1149. The HT secondary on this transformer is 225V-0-225V, rated at 300mA, and used with the bridge rectifier feeding two series-connected 100uF capacitors (with shunt resistors to equalise their voltage distribution), it gives a no-load output of 650V. This falls to 620V at a drain of 100mA, which is quite reasonable for the job.

The unregulated supply provided by the winding centre-tap, when filtered by the series 15 ohm resistor and 100uF capacitor, gives a no-load output of 320V. This falls to 300V at 150mA, as may be seen from the curve.

The PF1149 has a heater winding with high-voltage insulation which was originally used to run the heaters of two 6N3 rectifier valves. This winding was rated at 4.2A and is thus ideal for running the two 6DQ6A heaters in the present unit. Before I learned the current rating of this winding, I "played safe" by using it to supply only one of the 6DQ6A heaters, with the other supplied by a separate small heater transformer. This transformer is visible in the underchassis photograph, which was taken before I had the opportunity to remove it.

The PF1149 also has a heavy-duty main heater winding, which provides 12.8V centre-tapped at a rated current of 4.2A. It is thus able to supply some 8.4 amps at 6.3V, more than adequate for the 6BQ5 heater and the heater drains of most modest-sized transmitters. It is for this reason that I have not bothered to switch the heater line to each of the three transmitter outputs on the unit.



Above-chassis and underneath views of the prototype unit. Note that the small heater transformer shown has since been removed.

All things considered, the PF1149 transformer is more than capable of meeting the requirements of the power supply / modulator. So that if you are able to salvage one from a scrapped Pye TV receiver, as I was, it will do the job very well. There are probably similar power transformers in other old TV receivers which would be equally suitable.

However there may be some readers who will find themselves unable to obtain an old TV chassis yielding a suitable transformer, and perhaps others who in any case would prefer to use a new transformer rather than a used one. For these people, Ferguson Transformers have told me that they are prepared to make a new transformer. This will not be exactly the same as the old PF1149, which is really rather too conservatively rated for this project to justify the cost. Instead Ferguson has designed a new unit, with the specific requirements of the project in view. They will be giving it the code number PF3544.

You may have noted that in the HT rectifier bridge I have used four of the General Electric 1000V PIV "transient protected" or controlled avalanche diodes, type A14P. These cost a little more than the regular type of diode, although not much more now that GE are making them in Australia. At the time of writing they cost about 50c each trade. However in a project of this type where there is a large transformer and the HT is likely to be switched on and off frequently, the greater electrical ruggedness of these diodes is a big advantage.

In fact before I fitted the A14P diodes to the prototype unit, I had used regular 1000V diodes, but two of these blew on a switching

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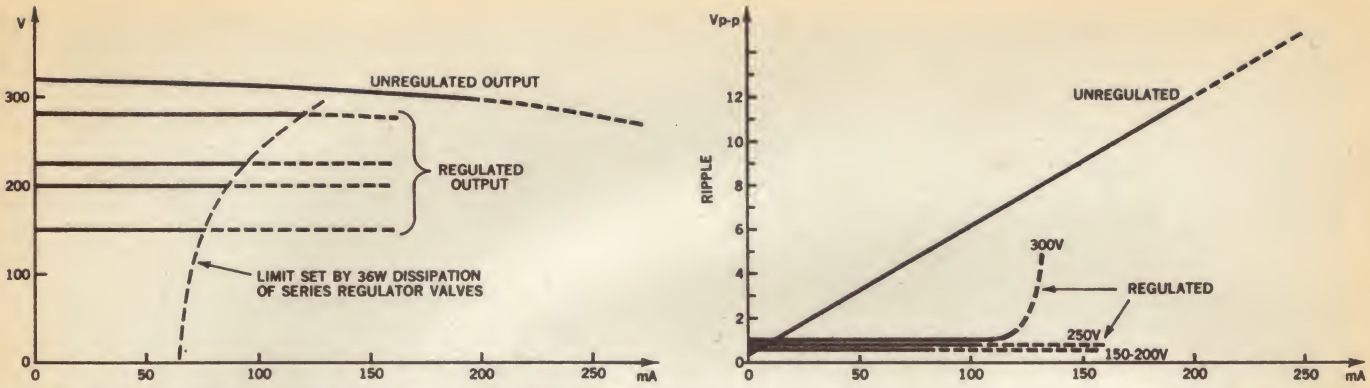

Curves showing the regulation and ripple characteristics of the unit as a power supply. Both regulated and unregulated outputs are shown.

transient about the fifth time I switched the HT off. Since fitting the A14P diodes I have switched the HT on and off many scores of times without a failure.

Having dealt with the basic transformer and rectifier circuit, perhaps I should return as promised to the more incidental aspects of the regulator / modulator section.

When the operation of this section was being described earlier, you may have noticed that there is a 24V zener diode in the cathode circuit of the 6BQ5 valve. This is used to provide a stabilised voltage for the transistors, making use of the cathode current of the 6BQ5 together with the bleed current through the voltage divider used to provide suitable screen grid voltages to the 6BQ5 and 6DQ6A's. The zener also maintains a fixed +24V cathode voltage on the 6BQ5, to allow transistor T2 to control the valve's bias by swinging its grid.

There is a small inductor (L1) in series with the HT output from the cathode follower stage. This consists of 100 turns of 22 gauge or similar enamelled wire, wound as a single layer coil on a 2½in length of 3 / 8in diameter ferrite rod. The purpose of the inductor is to minimise any phase shifts due to shunt capacitance which may be presented across the output terminals by a transmitter.

The regulator / modulator circuit is a feedback amplifier, and its stability therefore tends to be affected by any phase shifts caused by reactive loading. Inductor L1 serves to minimise such phase shifts, and this, together with loop response tailoring provided by the 680pF capacifor shunting the 6BQ5 plate and the .01uF capacitor shunting the collector of transistor T1, stablises the circuit for all likely load situations.

The modulation output will normally connect directly to the "cold" end of the transmitter's PA tank circuit, so that the only shunt capacitance present should be that of the usual RF bypass or feedthrough capacitor, together with the stray capacitance of the interconnecting cable and transmitter wiring. Typically the bypass or feedthrough will be no more than about .002uF, because larger values would start to attenuate the higher modulation frequencies.

The use of inductor L1 makes the modulator circuit quite stable for shunt capacitance values far above this likely figure. In fact the prototype unit is still completely stable even with .047uF shunted across the output. The unit should therefore be capable of operating with virtually any transmitter of up to about 32 watts input intended for high level plate or screen modulation.

The metering circuits should be fairly self-evident from the diagram. The voltmeter is connected permanently across the variable HT output, as the unregulated output remains substantially constant at 300V. The main part of the meter multiplier is made up from two resistors of near-equal value, to share the voltage gradient between them. The current meter is switched between the two HT output circuits to allow convenient monitoring of power input levels.

Also fairly self-evident is the wiring of the HT switch and the T-R keying socket. The HT switch is a DPST type which breaks both the negative side of the rectifier bridge, and also the unregulated output from the transformer centre-tap. This is necessary to ensure complete disconnection of both supplies. The 15-ohm resistor in the negative return of the bridge is to limit diode surge current.

The keying socket connections make it possible to complete both HT circuits externally when required.

I think that just about completes the basic circuit description. However before passing on to a brief description of the physical side of the unit, I should perhaps make a few comments about possible circuit mods and substitutions.

Probably the most likely reason why you may wish to modify the basic design is to increase its output capability, to allow it to operate higher power transmitters.

Assuming you are going to use the old type PF1149 transformer or a similar unit of very husky design, probably the easiest and best way of extending the output capability of the regulator / modulator circuit would be by adding a third 6DQ6A in parallel with the existing two. The 4.2A rating of the insulated 6.3V heater winding of the PF 1149 will easily cope with the additional heater drain, so that the only real circuit change required should be a reduction in the value of the top resistor in the screen grid divider. I have not tried this, but reducing the value from 20k / 10W to 15k / 10W should be a good place to start.

The additional valve would need to have its own 15 ohm series plate suppressor, 1k grid suppressor and 22 ohm cathode resistor, also a .001uF bypass from the grid to the HT output.

By this relatively simple and straightforward modification the current capacity of the regulator would be extended to about 180mA, allowing the unit to be used for full

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1 Instrument case and chassis (see text).
1 Power transformer, PF3544 or similar (see text).
2 1mA / 100 ohm meter movements.
1 Rotary switch, 3 pole 3 position.
1 Toggle switch, DPST
4 Miniature 4-pin sockets.
1 240V neon pilot bezel
1 6V incandescent bezel
1 DPDT slider switch

VALVES AND SEMICONDUCTORS
2 6DQ6A or similar.
1 6BQ5 / EL34 or similar.
2 2N3569, BC107 or similar.
1 BC109, SE4010 or similar.
1 6V / 400mW zener diode.
1 24V / 1W zener diode.
4 A14P or similar 1000V transient protected diodes.

RESISTORS
½ watt 5%: 4 x 10 ohm, 2 x 15 ohm, 2 x 22 ohm, 1 x 100 ohm, 3 x 470 ohm, 2 x 680 ohm, 1 x 820 ohm, 3 x 1k, 1 x 2.2k, 2 x 2.7k, 1 x 3.9k, 1 x 10k, 1 x 15k, 1 x 22k, 4 x 33k, 1 x 100k, 1 x 220k, 1 x 270k.
1 x 150k / 1W
4 x 220k / 1W
2 x 15 ohm / 3W
1 x 6.8k / 4W
1 x 15k / 10W
1 x 20k / 10W
1 x 1k linear pot
1 x 10k log pot.

CAPACITORS
1 680pF 600V polystyrene
3 .001uF ceramic
1 .01uF ceramic
1 0.27uF 160V polyester
1 4.7uF 10VW tantalum electro.
2 8uF 350VW electro.
1 30uF 10VW electro.
1 100uF 25VW electro.
2 100uF 350VW chassis mtg electro.
1 100uF 350VW pigtail electro.

MISCELLANEOUS
5-pin DIN socket for audio input, 2 x ceramic octal valve sockets, 1 x ceramic 9-pin socket, 2½in length of 3 / 8in ferrite rod for stablilising inductor, tagstrips, miniature resistor panel, hookup wire, nuts, screws, solder, etc. NOTE: Resistor wattage ratings and capacitor ratings are those used for our prototype. Components with higher ratings may generally be used providing they are physically compatible. Components with lower ratings may also be used in some cases, providing the ratings are not exceeded.

plate modulation of transmitters up to about 60W input.

A further increase in current capability could no doubt be achieved by using higher dissipation valves in place of the 6DQ6A's. I have used the valves because they are very easily obtainable at a relatively low cost. More exotic valves will generally involve considerably greater outlay, unless you already have some available or can obtain them from disposals sources. One fairly obvious choice would be the time-honoured 807; a pair of these would be capable of almost as much output as three of the 6DQ6As.

Other valves could be used in place of the 6BQ5, of course, although this is again an easily-obtained type. One could press a 6AQ5, 6BW6 or even an old 6V6 or 6F6 into service here, or perhaps the pentode half of a 6BM8 or 6GW8. It would also be possible to use a lower power type, providing it is rated to withstand 600V peaks on the plate.

The transistors are not unduly critical, and there are many other types which could be used. The main thing is to use silicon NPN types, with a BVceo rating of 25V or higher. T1 should preferably be a low noise type. The 6V zener may be a BZY88 / C6V1 or similar 400mW type, while the 24V diode should be a BZX61 / C24 or similar 1W type.

As I mentioned earlier, it is very desirable to use transient-protected diodes such as the A14P in the HT rectifier bridge. If you do elect to use regular diodes, I would recommend at least 1200V types, or series-connected 800V types with the usual equalising resistors and capacitors. Note that lower voltage A14 diodes may also be connected in series to replace the 1000V type A14P, if this is not available. In this case no equalising resistors or capacitors are needed, as the controlled avalanche action of A14 diodes makes them share reverse current and transients automatically.

The audio sensitivity of the modulator has been deliberately cut back, with the idea that the unit would be used in conjunction with a separate mic preamp / compressor. However if it is desired to use a dynamic mic directly with the unit, its sensitivity may be increased for this purpose simply by reducing the value of the 100-ohm resistor in series with the 30uF capacitor connected to the emitter of T1. Maximum sensitivity may be achieved by removing the resistor entirely and connecting the negative side of the capacitor directly to chassis.

I propose to give only a brief physical description of the unit, because with this type of project most amateurs will have their own ideas on the exact form which it should take.

The prototype unit is built in a fairly small instrument case measuring 12¼in x 7in x 6in (313 x 178 x 153mm). A good deal of the interior of the unit is taken up by the power transformer, with the two 100uF reservoir capacitors for the regulator mounted alongside it at one end of the chassis, and the two 6DQ6As and the 6BQ5 at the other end.

The two meters are mounted on the upper part of the front panel, with the mains and HT pilot lamp bezels between them. Immediately beneath the pilots is the rotary switch used for transmitter selection, with the HT switch and HT voltage control to the left under the voltmeter and the modulation control and audio input socket to the right under the ammeter.

Most of the minor components are mounted beneath the chassis. T2, T3 and the other comparator components are mounted on a 6-lug section of miniature resistor panel immediately behind the audio input connector, with T1 and the other amplifier

(Continued on Page 125)

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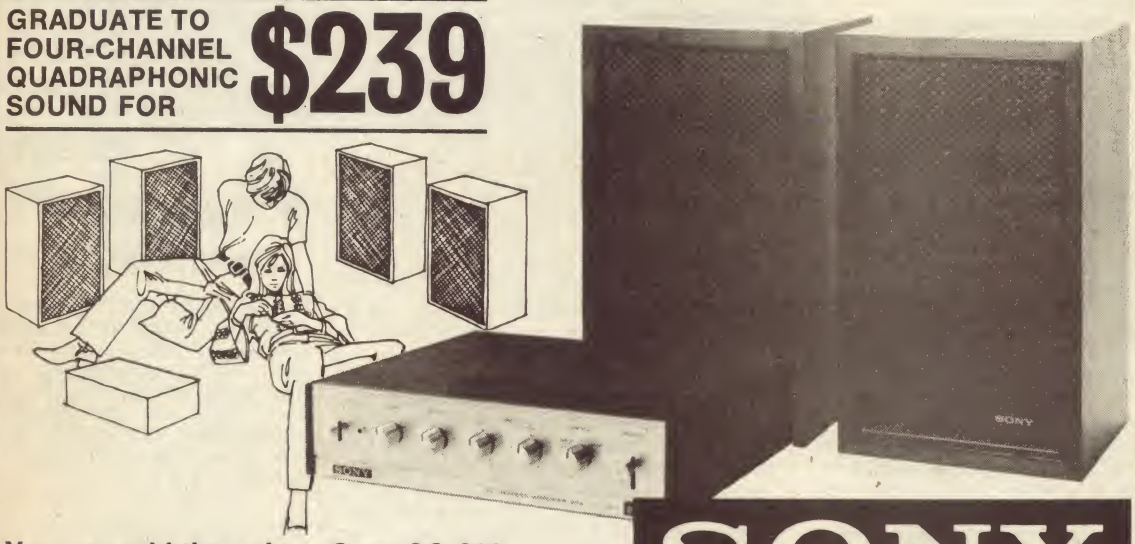

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FORUM

Conducted by Neville Williams

The impossible is still a tough assignment!

There have been some interesting developments in the field of artificial reverberation since we ran our article in these columns, in the April issue, under the heading "Curses . . . they've done the impossible!" Fortunately, our assessment of the overall position appears to have been confirmed rather than otherwise.

You may recall that the discussion was stirred by a query in our January issue about artificial reverberation systems. In our reply, we suggested that an all-electronic approach was virtually impractical at the present state of the art; further, that the best advice we could give was to stay with one or other of the electro-acoustic systems as, for example, the Hammond style spring system.

A reader from Victoria took us severely to task on the basis that electronic echo or reverberation units were being marketed commercially and had, in fact, been advertised in at least one Australian technical journal.

Our reply was to quote the price of this particular unit, to point to its rather specific but otherwise limited capabilities and to repeat our contention that it was not a practical proposition for the everyday role envisaged in our published answer.

Since then, there has been a certain amount of unpublished comment from interested readers seeking to make the point that integrated circuits are rapidly reducing the cost of digital functions. A digital delay system could be conceived that would cost considerably less than the $10,000-plus figure that was envisaged for the more elaborate versions of the Delta-T Audio Delay System.

Some of the estimates were suspect because they were based on inadequate delay times, or on the bare cost of so many IC's at so much each.

Estimates like this tend to fall far short of the real cost when one sets out to satisfy the actual requirement and provide for all the peripheral components and hardware. Over-the-counter costs, with tax added, have the unfortunate habit of rising far above off-the-cuff calculations.

But, even assuming that the cost is cut to a half or a quarter of the Delta-T unit, it still represents a big outlay for a non-specialist application.

Helpfully, a Victorian reader has taken it upon himself to prepare an excellent article on the subject of synthetic reverberation. In the article, he analyses the all-electronic proposition and comes up with some interesting conclusions about approach and cost. As you will note, when you get to read the article, it confirms the high cost of the electronic approach at present but emphasises the drastic reductions that can be expected in the foreseeable future.

In the meantime, I was most interested to read about an electroacoustic time-delay device that has recently been developed in the United States.

Inspiration for the device was an article in "Audio" magazine by Dr Duane Cooper. It detailed an acoustic delay line constructed around appropriate lengths of copper tubing and carefully matched input / output transducers.

The design was adapted for commercial production by Mr Bill Putnam of United Recording Electronics Industries, of Hollywood.

The expensive copper tubing was replaced, without loss of efficiency, by rigid-walled polyethelene tubing. The two lines, providing delays of 16 and 14mS respectively, were coiled up inside a box measuring 24 x 24 x 9 inches. Vacant space was filled with styrofoam pellets to prevent movement of the tubing and provide additional acoustic insulation.

A separate rack mounting unit, connecting to the box by cables, contains the associated amplifiers, equalisers and control facilities. The two channels can be used in parallel or in tandem, according to the nature of the delay required.

To this point the Cooper / Putnam "Time Cube" is no more than a careful application of well established principles. What does make surprising reading are the performance specifications. Total harmonic distortion is claimed to be less than 0.5% and the signal / noise ratio greater than 70dB.

The Time Cube is now a standard line from United Recording and Bill Putnam sees it as a most useful piece of equipment to have in studios, both to enliven "dead" program material and for the simulation of four-channel ambience.

My own reaction is that electronics engineers will always have a built-in preference for electronic technology — other things being equal. But they are not equal yet and, if Putnam's new electroacoustic Time Cube is as good as he claims, equality will be further delayed.

Still on the subject of audio but with another emphasis, we acknowledge a letter from a reader in Redfern, NSW. He says:

Dear Sir,

I read with interest your discussion re deterioration of hearing at the high frequencies in the June issue.

I am so close to 50 that it doesn't matter and I believe that my hearing has not deteriorated significantly in this respect as yet. I think it possible that this is due to the fact that I have never subjected my ears to large volumes of high frequencies from a separate tweeter. My present equipment consists of a pair of 12" twin-cone Wharfedales which give all the highs that I need.

Do you think it possible that some people hasten this natural process by feeding their ears with too much high frequency volume? Certainly the filaments of the ear which transmit these frequencies would be the most delicate. Of course you would have heard the one about the Hi-Fi addict who attended his first orchestral concert and left the hall muttering "not enough highs, not enough highs".

Yours faithfully, A.F.

It has often been stated that protracted exposure to excessive noise can cause hearing damage and the likely victims nominated have ranged all the way from jack-hammer operators to pop musicians. As a rule, the damage is assumed to be a general loss of acuity, without much emphasis on the finer details.

The concern of people who repeat such statements is to get across one simple message: For the sake of our nerves and our ears, we should avoid making excessive noise or exposing ourselves to excessive noise.

Dear Sir,

I would like to reply to F.B. in the June "Forum". I am having much the same trouble: (to put it bluntly) old age creeping on!

I have a large Hammond organ with reverberation, Lux amplifier and Wharfedale speakers, but the left speaker always sounded louder than the right. I checked the output on both and found them identical.

Again, the treble seemed to lack brilliance. Two extra tweeters improved it but only slightly.

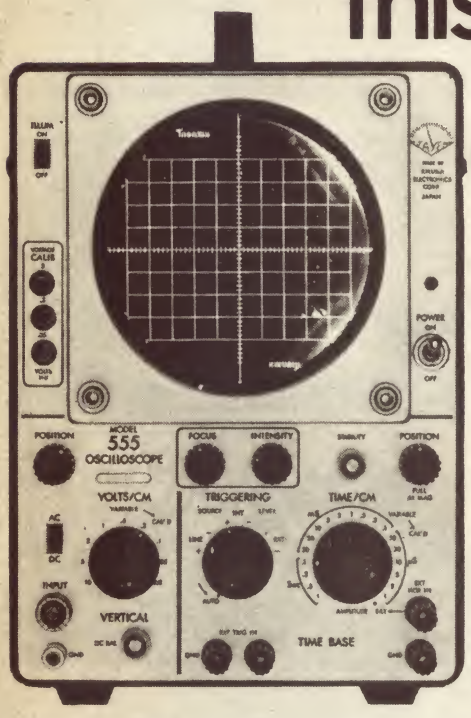
Subsequently, I purchased a spectacle type hearing aid, having an aid to each ear, separately controlled. This greatly improved the upper register and by adjusting the volume to each ear, I was able to get correct balance from the loudspeakers.

I keep the hearing aid specially for listening to my organ and stereo and find it well worth the slight inconvenience of having to wear it. If F.B. were to submit to a test by an expert in hearing aids, he may possibly gain the help he needs.

I would recommend the type of aid which does not completely block the ear. Get the type with a small tube that enters the ear; it does not block direct sound but acts as a form of boost.

C. S. (Moruya, NSW)

TV servicemen... this instrument is ..keyed to COLOUR



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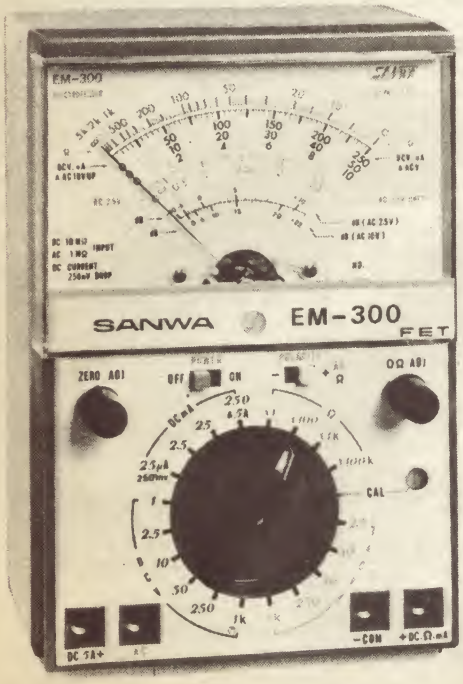

FET testers are universally acknowledged to possess unique qualities not found in conventional testers, and until SANWA brought out the EM-300 they were priced accordingly.

Realizing the need for a topclass tester able to handle impedances of 1 MΩ for ACV and 10 MΩ for DCV, SANWA not only satisfied it but added the bonus of galvanometer versatility to the EM-300 — a worthy newcomer to the line of SANWA's famous testers.

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dB −10~+10dB (2.5V AC) 0~+22dB (10V AC)
Semiconductor N-ch transistor X2 RF silicon diode X2
Accuracy ±4% fsd. for DC and AC
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TO ADVERTISERS FROM NEW ZEALAND

Dear Sir,

As an avid fan of "Electronics Australia" for many years may I add my congratulations and thanks for the most interesting and varied content of your publication. In fact the number of copies I have purchased over the years pose a storage problem, as I am most reluctant to part with even one copy.

I am already well aware that you have little control over the content of advertisements placed for publication. However the interest of your New Zealand readers would be increased considerably if those advertisers producing kit-sets resulting from your projects would kindly include retail prices with such advertisements.

As we have quite some difficulty in obtaining many of the items required to complete the projects the kit-set is an excellent method of obtaining the necessary components. No doubt there is a ready market for export to New Zealand, should your advertisers wish to take advantage of the relaxation of our regulations making it possible to transfer funds for such items.

Those advertisers who show the retail prices often confuse us with the term "Plus Sales Tax". Would you kindly advise:

(a) Is Australian Sales Tax added to items exported to NZ?

(b) If so, how much is it?

I trust you have some success in convincing your advertisers that the inclusion of prices would be of much assistance to us here in New Zealand.

Yours faithfully,
R. S. Banks. ZL1AUI.

With which I heartily agree.

However, our correspondent raises the question as to whether hearing damage is selective in terms of frequency; whether some of the loss attributed to age is really due to excessive exposure to boosted highs.

My own reaction is that any such connection would be very difficult to trace. Progressive deterioration of hearing, beginning at the treble end, seems to be an almost universal characteristic of advancing years. It happens to vast numbers of people whose listening has been confined to the mellow tones of the average radio or television receiver.

If our correspondent's ears are unaffected at 50, I would be inclined to put it down to good health and good fortune rather than to good loudspeakers. Whether he will still be saying the same kind of thing at 55 remains to be seen.

From a New Zealand reader comes a plea that prices he included in all advertisements, to expedite ordering from that country.

In fact, as Mr Banks observes, the content of advertisements is entirely up to the respective advertisers. They decide upon what goods to feature, whether or not to mention price and whether or not to quote a nett retail figure, or a base figure with sales tax to be added.

Fairly obviously, the purpose of some advertisements is to draw attention to a particular product, leaving it to the individual to inquire about the price from his particular supplier. The price may vary from state to state, or with the pricing policy of the supplier, who may be a discounter or a dealer offering supplementary services. In such circumstances, a single recommended price could cause more arguments than it saved.

Again, with kits of components the overall cost, these days, is anything but stable. An advertiser has to choose whether to budget for such variations within the likely reaction time of readers, or simply to request more money should this be necessary. He may do neither, preferring to advise customers that he can supply kits — at prices which he can quote in response to firm inquiries.

What about sales tax?

Here again, it is up to individual advertisers to decide how their prices shall be quoted, having in mind the nature of their business.

With professional or semi-professional products it is fairly common practice to quote the base price to which sales tax has to be added. It is assumed that the purchaser will be able to calculate and add the appropriate tax figure or, alternatively, to arrange the appropriate documents if the items qualify from exemption.

Where an item is exported directly by the vendor, it need not attract Australian sales tax. It is necessary only to meet the base price plus the necessary packaging and shipping costs. We understand that, provided the Australian supplier arranges despatch (post, airfreight, cargo, &c) the associated documents are accepted by the Australian authorities as evidence that sales tax did not apply.

There may, of course, be surcharges at the other end, depending on the destination.

Much the same holds for small components or kits ordered from Australian suppliers.

If a supplier is willing to accept orders from overseas customers, kits or components can be despatched without an Australian sales tax content.

Two things need to be done: One is to establish contact with an Australian parts supplier, to verify that they can supply and the basis on which it can be done. The second is to arrange the necessary money transfer in a mutually convenient form.

Some advertisers in the magazine quote nett prices, either without mention of sales tax or endorsed "incl. sales tax". They may or may not be prepared to export on a no-sales-tax basis.

Where they are virtually "retailing" an item, sales tax may already have been paid. Although the tax may theoretically be recoverable, the time and trouble involved in so doing could be prohibitive.

I know it sounds complicated but it really boils down to this:

(1) New Zealand or other overseas readers can arrange to buy components from Australian suppliers without necessarily attracting Australian sales tax;

(2) Not all suppliers are set up to meet overseas orders conveniently;

(3) On some items sales tax may already have been paid as, for example, on clearance or job lots. It would not be practical to deduct and recover it.

In all, Mr Banks' letter opens up an interesting area for consideration.

It may cause advertisers to look more closely at their reasons for quoting prices in a particular way.

It may cause them to consider more specifically the needs of New Zealand and other overseas readers.

It may prompt correspondence from overseas readers who have stories to relate about their successes and failures in obtaining components for E.A. projects.

Thanks to the European Common Market, trading relationships in this area are currently being re-examined. What better time to facilitate the flow of electronic components across the Tasman — in both directions!

The Things People Do to Sets

A small proportion of sets which a serviceman encounters differ from the majority in one important respect. Whereas the majority suffer from simple component failure, this minority suffer from user abuse in some form.

As you might have guessed, that comment was prompted by a particular incident; an incident noteworthy because the abuse was not merely "accidental" in the usually accepted sense of the word. It would be more correct to describe it as gross carelessness on someone's part.

The equipment was a National AC/battery stereo cassette tape recorder; a very nice and quite expensive unit which, one would imagine, would have been treated with more respect.

Exactly who was responsible for what happened was not revealed. As far as I was concerned the set was delivered to me with a rather cryptic note explaining what had happened and asking that it be reparied. I deemed it diplomatic not to stir up painful memories by asking nunecessary questions.

And, for once, questions did not appear to be necessary. The note said simply, "Connected in error to 240V through plug on side attached to battery holder." In short, the mains had been applied to the battery terminals. Which seemed to say most that needed to be said!

One of the few remaining questions, "how?" was answered by a glance at the unit. Some bright boy had connected one end of a length of figure eight flex to the positive and negative battery terminals, and the other end to a three pin plug.

What a perfect set-up for disaster!

Why? I'm only guessing, of course, but I find it hard to believe that anyone could be so ignorant as to deliberately intend that 240V be applied to the battery circuit. I think it is much more likely that it was a scheme to permit use of an external battery in some form, and that a three pin plug and socket were the only connectors immediately available. Subsequently, someone either didn't know or forgot. . .

The only bright spot was that the owner had had the foresight to obtain a service manual when he bought the machine, probably overseas. With the benefit of hindsight it was just as well, because I did not have one and I doubt whether I could have managed without a copy of the circuit at least.

Quite frankly, I expected a charred mass when I opened the case, but was agreeably surprised to find that there was little superficial evidence of what had happened. It was a different matter when I removed the printed board. The output transistor heatsinks are mounted on the printed board, at right angles to it. The transistors are in the centre of the heatsinks, with fairly long leads running to the appropriate points on the board. The insulation on these leads was a mess of melted plastic, and it didn't need a genius to conclude that the four output transistors had "had it."

It was even more obvious that the four 0.47-ohm emitter resistors had also "had it" while several other resistors were in two pieces. As a matter of interest I connected it to the bench power supply and checked the current. It was nil.

I replaced the output transistors, the emitter resistors and the obviously damaged feed resistors. Then I applied power again. I wasn't surprised when it didn't work, but I was surprised that there was still no current drain.

At this stage I settled down to a more detailed examination of the circuit and the board. Relating the two, and checking continuity of the board as I went, I soon made the rather startling discovery that certain short lengths of copper pattern, obviously essential, simply did not exist. They had apparently disintegrated, so completely and so cleanly that their absence was not immediately apparent.

I replaced these with suitable lengths of wire. That done, more continuity checks were made and it was obvious that the main supply rail was shorted. This turned out to be caused by a number of shorted bypass capacitors, which were duly replaced. Another test on the power supply still failed

A Few Facts on Colour TV

Below is a reproduction of a card being distributed in some Sydney suburbs. We have deleted the firm's name, since we have no desire to provide them with free advertising.

An obvious attempt to attract more customers for its maintenance contracts — a legitimate enough cause in itself — it has offended some people by reason of its, to them, ambiguous wording.

COLOUR CONVERSION!

As you know colour TV is coming to Australia within 3 years . . .

Our expert team of technicians will convert your black and white set to receive those channels which will transmit the colour programmes

FREE OF CHARGE

If you are a TV Maintenance Contract holder for 12 months or more

Be that as it may, it does suggest that it is time to re-state a few facts about colour TV for the benefit of anyone who may still be confused.

(1) There is to be no change of channels involved with the conversion to colour.

(2) There should be no question of black and white sets being "converted". They cannot be "converted" to display a colour image, and they do not need to be "converted" to display a black and white image from a colour transmission. In fact, a significant proportion of programs, particularly those on tape from Great Britain, are currently being transmitted in colour, without the average viewer even being aware of it.

(3) It is true that sets which are seriously out of alignment, and already displaying poor quality black and white pictures, may display pictures which are even more degraded when receiving colour transmissions.

(4) In these latter circumstances, nothing short of a complete alignment could be expected to cure the problem. Alignment of a TV set is a long, complicated and, consequently, costly process. Can any maintenance contract firm afford to provide such a service, free, for each of its customers, should they demand it?

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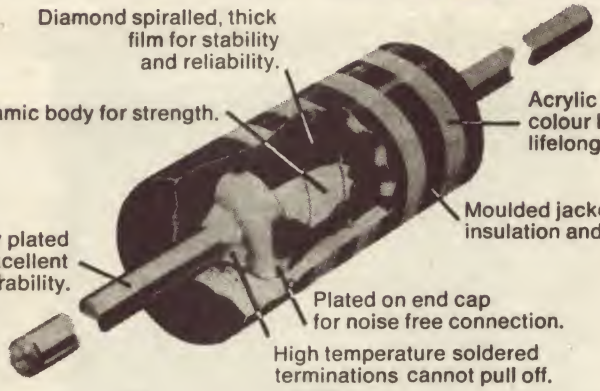

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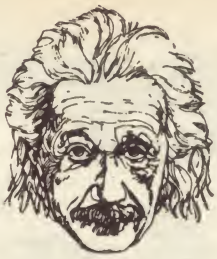

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We've proved it. And proved it conclusively. Of course, we had a little help from our friends, the sound fiends!
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So, we're sorry to disillusion you, but 6 into 1 does go. And if you don't believe us, come and have a listen.
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to reveal any current drain, so the supply was moved from the battery terminals and connected directly to the board.

At last I had current drain and some sign of life. To be sure the current was only about half what it should have been, and the sound was weak and distorted, but it was a start. Interestingly enough, performance appeared to be about the same on both channels.

At this point I allowed my thinking to be sidetracked. I was intrigued as to why the board would work with power applied directly but not with it applied to the battery terminals.

It was then that I spotted the relay. It was on a little outrigger board of its own and it was looking a bit black in the face. Reference to the circuit eventually revealed it, though it wasn't very clearly portrayed. Its coil was connected directly across the power supply bridge rectifier, and a single changeover contact set was arranged to switch between the battery and the mains supply. Thus changeover from mains to battery or vice-versa was completely automatic, depending on the presence of mains voltage.

I pulled the relay out, cleaned the black coating off it, and took a closer look at it. At first I could see nothing wrong with it. The contacts appeared to be intact, the coil showed continuity, and there seemed to be no reason why it wouldn't work.

It was only when I started tracing continuity from its terminals through its contacts that I realised what had happened. It was the type of relay in which the moving arm pivots rather than bends, and connection to the moving arm is via a short length of thin flexible metal braid. Only there wasn't any braid, just rough ends protruding from the solder at each end of where it should have been. Yes, it too had disintegrated, again so completely that I was tricked into overlooking its very existence.

Fortunately, that wasn't hard to fix, and I soon had power to the board from the battery terminals. But performance was still poor, sounding very much as though only one half of the output stage was working. Thus alerted, I began checking around the speaker circuit and very quickly realised that the blocking capacitor between the emitter-collector junction and the loudspeaker had broken down. The same applied to the other channel.

That fixed it. The machine played like a charm and, apart from general tidying up and routine checking, needed little more attention.

I heaved a sigh of relief. It had been a long job, and a tricky one, and the customer would have to foot a pretty substantial bill. On the other hand, I was agreeably surprised that the job had turned out as well as it had. Looking over the circuit I realised that a number of other things could have suffered.

For one thing, I am still not quite sure why the speakers had not been damaged. Perhaps the copper foil disintegrated so rapidly that they had no time to become distressed. Perhaps they happened to be switched out in favour of the headphone jack. Anyway, they survived.

Another nasty possiblity was the motor and its associated electronic governor circuit. Damage to the motor may have involved an awkward replacement problem. Damage to the governor components could have resulted in some tricky work with unfamiliar circuitry. Fortunately, this had also escaped unscathed, probably because the motor was switched off.

So, the owner was really quite lucky, in spite of the big bill. And, large as it was, it was still small compared with the replacement cost of the complete unit.

Speaking of "user abuse" how does this one grab you? One of my regular customers phoned me the other day and asked whether I would answer a technical question on behalf of a friend. Somewhat guardedly, I said yes.

Well, it seemed that this friend, who was more of an amateur cabinet maker than an electronics type, had just built himself a rather elaborate speaker enclosure, and was about to mount a good quality and fairly expensive speaker in it.

Apparently he was worried about the finished appearance. He wanted to retain stained wood under the grille cloth, but didn't like the effect of the black speaker cone still visible through the cloth.

His question? Could he safely paint the speaker cone to match the wood!

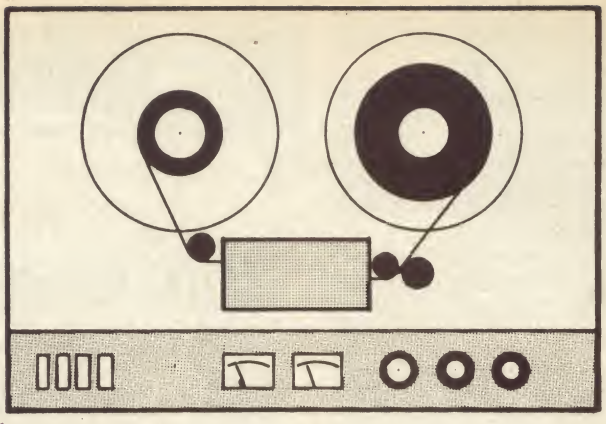
Finally, a few words about the picture on the left. We have all experienced the frustration of trying to introduce cleaning fluid into an awkwardly placed pot. This aerosol is designed to meet just this problem.

It is supplied with an aluminium tube, tapped at one end to fit the pot mounting thread and shaped at the other to fit a special press button on the can.

To use, one removes the knob, screws on the connector, and fits the aerosol to the other end. When the button is pressed the full pressure of the can is used to force the cleaner into the pot.

I have not had an opportunity to try the device in the field, but the idea appeals as being basically sound.

The sound quality of reel to reel...



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It's in with the CLICK Clique

Just click a cassette into a Kenwood KX-700 Cassette Deck for the ultimate in *compact* hi-fi. Sound as real as reel to reel is yours because KX-700 incorporates the DOLBY unit that cuts tape hiss to an inaudible low . . . whether you listen on headphones or pipe the great sound through your stereo hi-fi system. There's no toying with tapes . . . cassettes click in—pop out—and your hands are free for better things. Get long-play, fuss-free real sound enjoyment . . . Kenwood KX-700 stereo Cassette Deck.

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Electronic Reverberation

The first of two articles which explain the principles of electronic reverberation systems, and discuss the techniques which have recently been developed for implementing them.

by ALAN M. FOWLER, MIE Aust., MIREE*

Once considered impracticable, the fully electronic reverberation unit is now a reality. The development of multistage shift registers on a single integrated circuit chip has opened the way for the design of electronic reverberation units which will overcome many of the problems of the mechanical or acoustic systems used previously.

Reverberation occurs naturally in an enclosed or semi-enclosed space because the sound waves from a source are reflected from the walls or other surfaces, and reach the listener after the direct sound, as shown in Fig 1. The ear does not distinguish individual echoes unless they are separated by more than 40 to 60ms, and provided that the delays between successive echoes is less than this, they blend together to give the sound a pleasant fullness.

Many of the delayed sounds reaching the listener will have been reflected more than once, and at each reflection they lose energy until they are too small to make any useful contribution to the sound level. When the original sound stops suddenly the sound level at the listener will die away slowly as the delayed sounds keep arriving.

The time taken for the sound level to drop by 60dB from its original level, i.e. to one thousandth of its original value, is called the reverberation time.

In practice, acceptable reverberation times depend on the size of the room and whether it is being used for speech or music, and are generally in the range of 1 to 2 seconds. If the reverberation time is much less than 1 second, the room sounds dead, and speech or music recorded under these conditions will sound thin or lacking in body. If the reverberation time is much greater than 2 seconds the syllables in speech will run together making them unintelligible, and music will sound muddy or lacking in brilliance. It is very difficult to remove excessive reverberation from a recording, and the room must be treated to reduce the reverberation time to an acceptable value.

Where the reverberation time is too short, it is possible to add additional reverberation to improve the sound. There are quite a few techniques for doing this, using acoustic, mechanical, or wholly electronic methods.

In order to understand the process of generating artificial reverberation let us look at a suitable way of representing how reverberation occurs naturally. Sound travels at approximately 1130 feet per second, so that each path will introduce a delay of 885µs for each foot of length. The simple case of a direct ray and three indirect rays in Fig 1 may be thought of as four paths in parallel, each containing one or more sections introducing delay, and having an attenuator at each reflection to represent the loss as energy is absorbed. These paths are represented diagramatically in Fig 2.

Because the system is linear, i.e., the sound energy is only delayed, reflected or partially absorbed without any other changes such as the generation of harmonics or other spurious frequencies, the various paths in Fig 2 can be simplified and combined into a single delay line as shown in Fig 3. The line is tapped at points corresponding to the total delay in each path, and the respective attenuators represent the total loss in each path. A more complex case can similarly be represented by lengthening the delay line, and adding additional taps and attenuators.

The amount of energy lost at each reflection will vary with frequency, and will depend on the sound absorption characteristics of each reflecting surface. A complete representation of the reverberation behaviour of a room would therefore require that the frequency range be split into a number of bands, and each band represented by a unit similar to Fig 3, but having different attenuator settings.

Again, because the system is linear, only a single delay line is needed, the various taps for each frequency band are fed to separate amplifiers for each band, and the outputs of the amplifiers passed through suitable filters before combining. The case for three bands is shown in Fig 4, and this may be extended to any number of bands as required.

In practice, for many applications, it is only necessary to cover the range from 200Hz to 4500Hz using a single band.

If the time delay between each tap in Fig 3 was the same, and there was equal loss at each reflection it would be possible to simplify the design even further, by using a single delay section, and feeding part of the output back to add to the input as shown in Fig 5. This would produce a series of echoes at intervals of t seconds, each echo being smaller than the previous one by the loss around the loop. If the delay is made 10ms and a reverberation time of 1 second is required (60dB drop per second) the loop loss will be 0.6dB.

The system uses positive feedback, so that with a continuous signal at the input, each successive pass around the loop will add energy to the system, and the signal output will build up to a maximum value given by

$$Vout = Vin / (1-r)$$

where "r" is the fraction of the voltage fed back around the loop. For a loop loss of 0.6dB, r is 0.933 and the signal output will be 15 times the input, ie, there will be a system gain of 23.5 dB.

Because positive feedback is being used, and the system is operating just below oscillation, a small change in loop gain will have a significant effect on the output level. If the loop loss changed from 0.6dB to 0.5dB, r would become 0.944 and the system gain rise to 25dB — ie the output would rise by 1.5dB for a 0.1dB variation in loop gain, and

* Australian Post Office Research Laboratories, Melbourne

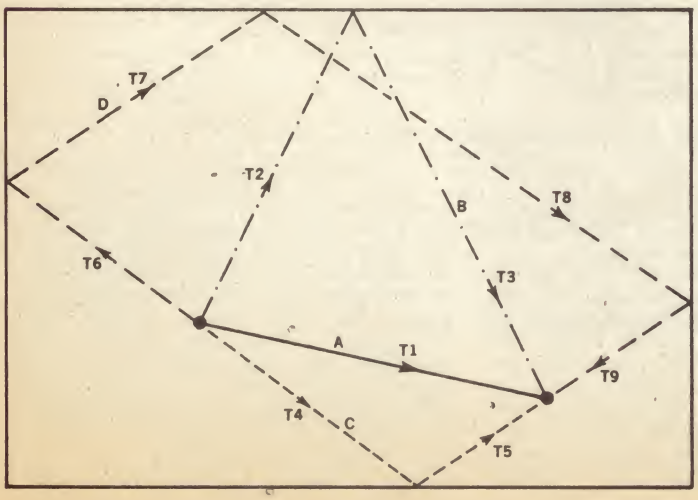

Fig 1. Reverberation occurs naturally in an enclosed space as sound waves are reflected from the walls and other surfaces to reach the ears of the listener after the direct sound.

at the same time the reverberation time would rise to 1.2 seconds. This sensitivity to small changes in the loop gain of the system places very tight limits on the frequency response and overload characteristics of the loop.

While an artificial reverberation unit could be made using the arrangement in Fig 5, the results would not be entirely satisfactory. For a fixed loop delay, the phase of the signal arriving back at the input will depend on the frequency, and while the signals will be in phase for some frequencies they will be 180° out of phase at others, resulting in cancellation.

For a 10ms delay there will be a series of peaks and troughs at 100Hz spacings throughout the band. The peaks can be made closer together by increasing the delay time, but this cannot be made much longer than 40ms or separate regular echoes will be apparent. The peaks and troughs in the response can be broken up and smoothed out by taking the feedback from several taps which are not simple multiples of one delay.

So much for the theory, which is fairly simple and straightforward. It would seem easy enough to make an electronic model of Fig 3 if a suitable method of delaying the signals would be found. Until recently, it has not been easy to make a fully controllable delay line.

One of the first systems used, and which is still in use, was to place a loudspeaker and microphone a suitable distance apart in a room having the desired reverberation characteristics. While simple, it takes up space which could be more profitably used for other purposes, and hardly qualifies for portable applications. In addition, special care has to be taken to keep extraneous noises out of the room — there are many stories in broadcasting circles of rooms that had been pressed into service to provide reverberation, only to find the staff playing table tennis, or a cleaner dropping something heavy on his foot and speaking at length on the subject during an otherwise quiet passage!

The next approach was to use a long concrete pipe, or a length of water piping, preferably buried underground, with a speaker at one end, and one or more microphones along the length. This overcomes the external noise problem, but is still not portable. An extension of this approach is to use a small diameter plastic tube to carry the sound. The tubing can be coiled up conveniently, and may be mounted in acoustic insulating material to reduce the effects of external noise.

The tubing behaves like a transmission line, and the acoustic impedances of both the speaker and microphone are not matched to that of the tube, so that part of the energy will be reflected back to the speaker, where part will be absorbed, and the remainder reflected to the microphone. The combination will produce a series of echoes of decreasing amplitude, and spaced at odd multiples of the one way delay through the tube. This solution provides a compact, lightweight unit; the main problem is in obtaining sufficient bandwidth and a flat response.

Instead of using air in a tube, the sound waves may be transmitted through a liquid or metal. The Hammond reverberation unit (references 1,2) uses a long thin wire which has been coiled into a spring as the delay line. The Hammond unit actually has two delay lines in the one unit, with delays of 29ms and 37ms respectively, to help make the echoes appear more random.

As in the case of the pipe, there will be multiple reflections because of the mismatches between the impedances of the line and transducers, and the energy will bounce backwards and forwards along the line until the level drops to the point where it makes no significant contribution to the ouput. Again the problems are bandwidth and flatness of response, and the need to insulate the assembly from external vibrations.

Another approach for providing the delay is to use a tape recorder having an erase and record head, and one or more separate replay heads. With a head to head spacing of 1 inch and a tape speed of 7½ inches per second, the delay will be 133ms. This delay produces echoes which can be heard separately. By using high speed, and possibly smaller heads, it is possible to obtain shorter delays, but the delays are not likely to be much shorter than 20 ms without using excessive tape speeds.

The Schober reverberation unit (reference 3) is designed for use with

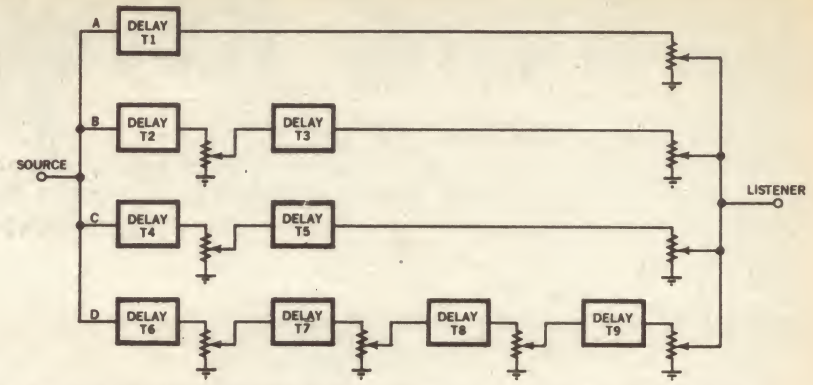

Fig 2. Showing how the various paths may be represented in a block schematic.

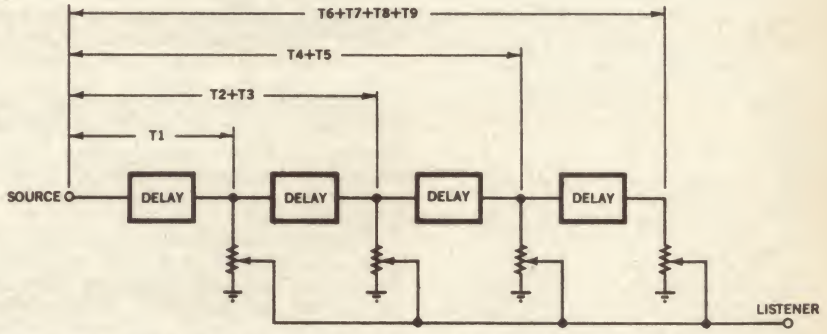

Fig 3. The various paths of Fig 2 can be simplified into a single delay line.

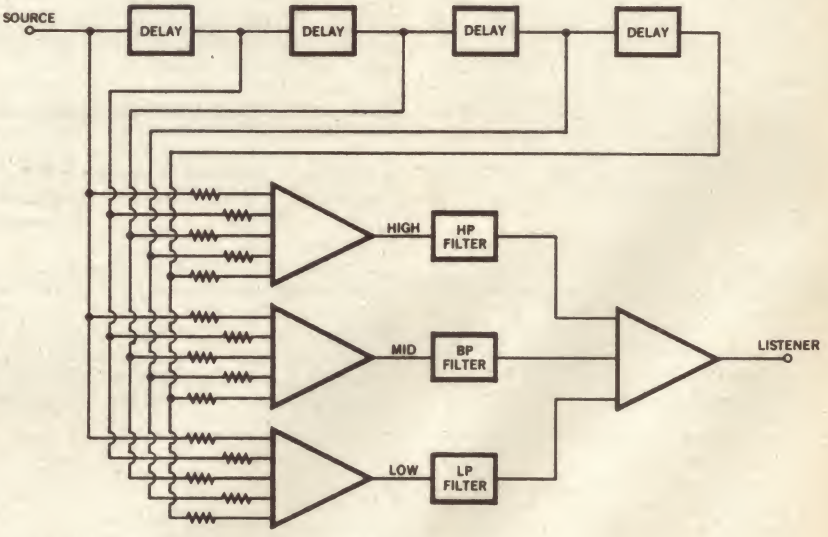

Fig 4. Schematic for a three frequency band system.

electronic organs, and has three replay heads spaced to give successive delays of approximately 110ms. The output of the third head is attenuated and added to the original signals feeding the record head. With a 330ms delay, the loop attenuation will be 20dB for a reverberation time of one second or 3.3dB for six seconds. With such big attenuations, the frequency response of the system is not affected greatly by small changes in loop loss, and eases the design considerably. Dorf and Evedon, the

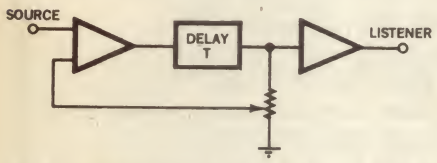

Fig 5. Showing how it is possible to simplify the design further by using a single delay section and feeding back part of the output.

designers of this unit, defend the choice of 110ms for the individual delays — a figure which will produce separately identifiable echoes — on the grounds that it produces a more natural sound at longer reverberation times.

Various workers have found that in reverberant rooms, the ear tends to select the echoes produced by the longest dimension of the room, and to judge the room size from this. They claim that systems using a short delay, and a smooth reverberation decay curve, sound unnatural at longer reverberation times, because of the absence of these longer delays. The effect of using a long delay can only be evaluated subjectively by each listener in each particular application, and any discussion is likely to result in more arguments than those about the merits of different loudspeaker systems.

The use of a tape recorder overcomes the problems of bandwidth, external noise, and portability, but introduces others. It is usual to have a continuous loop of tape and even using very special grades to minimise wear, the loops must be replaced at intervals of about 500 hours. The tape splice must be carefully made and preferably welded to prevent it pulling apart in use, and to reduce the level of the clicks as it passes over the heads. The background noise, wow, and flutter must be kept to a very low level — it is very annoying to hear flutter on the echoes when it is not present on the original sound.

All of the methods mentioned thus far use mechanical delay lines, with all the problems associated with such lines. A fully electronic delay line allows a much simpler approach, as will be shown in the next article.

The permission of the Senior Assistant Director General, Australian Post Office Research Laboratories, to publish this article is hereby acknowledged.

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3. R. H. DORF and R. C. EVEDON, "Design of the Schober Reverbatape Unit," Electronics Australia, November 1968, pp. 104-113.

Microwaves for the radio amateur — 5

Continuing his short series of articles written to stimulate more activity by radio amateurs on the microwave bands, the author this month begins the description of a complete and practical 10,000MHz station.

by DES CLIFT, VK2AHC*

The September, 1971 issue of "Electronics Australia" gave some details of the prototype solid state equipment in use at the author's station, then VK5CU. The microwave side follows the lines of Fig 2(c) in the May article, and is a single parabola, circulator coupled arrangement. The power supply as a DC / DC converter transformer with a single high voltage winding, and this dictated that the klystron heater supply be run direct from the 12V car battery. This in turn precluded the use of earthed cavity (waveguide output) type klystrons, and therefore a 2K25 was used.

The second set of equipment about to be described uses the two parabola microwave system of Fig 2(d), and has separate units for the power supply, other electronics, and the microwave side. The fact that two DC / DC converters are used is solely due to the fact that the writer happened to possess two small toroidal transformers ex mobile radio sets which were suitable for the job. A single transformer with suitable output windings would be better since it would save a pair of power transistors and give higher efficiency.

Fig 19 shows a photograph of the complete assembly, while Fig 20 gives a circuit diagram. The reason for separating the power supply was twofold. Some trouble was experienced in the prototype due to audio pick-up from the relatively large and fast edged square waves which occur in this type of DC / DC converter, and separating the power supply solved this problem while also serving to keep the weight of the main framework to a minimum. This was required in order to cater for the possiblity of it being mounted on a car roof rack for transport.

The use of two similar DC / DC converters operating in parallel did not give rise to any low frequency beats appearing in the ripple voltages of the outputs, as had been anticipated. Both converters use linear core transformers (T1 and T2) with RC timing, and operate at about 1600 Hz. Note that the 5uF capacitor is a non polarised type, rated at 100V working. T1 and T2 both have windings giving about 200V and 20V RMS which are used, plus one 3.15V CT winding which is unused.

T1 provides, via a voltage doubling bridge rectifier using 750V or 1KV PIV diodes, a supply of 380V. The output is smoothed by a low resistance, high frequency choke L5 and an 8uF / 600V paper capacitor before being fed, via a limiting resistor, to two high voltage zener diodes connected in series. This constitutes the cavity supply.

For CV 2282 / K308 / K311 and other klystrons designed to operate from a 300V to 350V cavity supply, this supply can be obtained from one IN3015 (200V) and one IN3011 (150V). For 2K25 / 723A / B / 726A and other klystrons designed to operate from a 250V to 300V cavity supply, it is suggested that 280V be used, from one IN3011 (150V) and one IN 2011 (130V). In either case, the current through the zener diodes, with the load disconnected, should be adjusted, by selection of R (series) to about 40 mA.

The corresponding circuit connected to T2 supplies a second high voltage, which is used for the klystron reflector. This voltage is arranged to be approximately 300V by a further pair of series connected high voltage zener diodes. In this case RC smoothing is used and the no load current is adjusted to approximately 15mA by means of the series R. (This current is purposely made several times the load current to secure reflector voltage stability under conditions of low battery voltage).

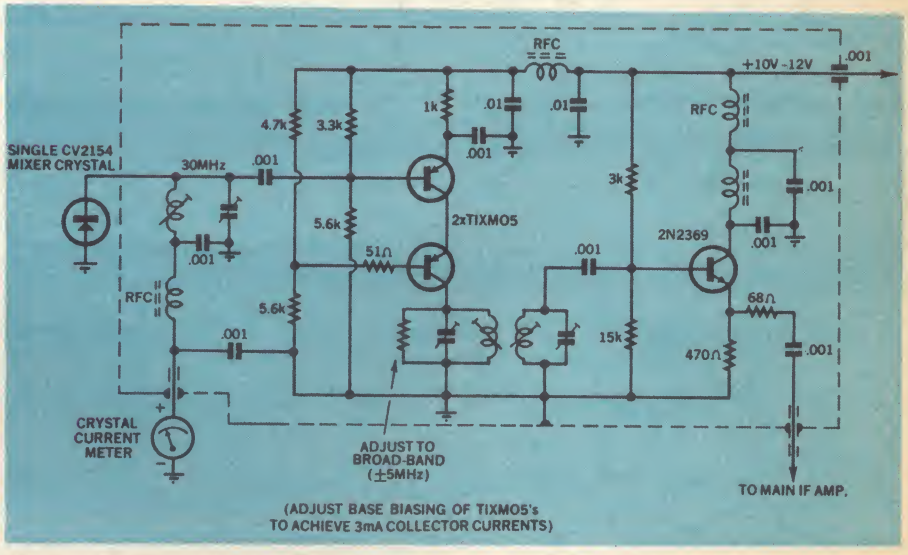
In the klystron in use in this equipment, (as opposed to the prototype) the cavity is run at earth potential and therefore the positive of the 350V supply is earthed, the negative being connected to the positive of the 300V reflector supply, and also to the cathode / heater of the klystron. The negative of the 300V supply (thus at −650V with respect to the earth cavity), is fed out of the power supply unit to a potentiometer network in the control panel.

The low voltage winding on T2 is fed to a conventional bridge rectifier with smoothing provided by 470uF capacitors and approximately 10 ohm resistors. This is fed to a high power 6.2V zener diode 10Z6.2, which has its unloaded current adjusted to about 0.8A by adjustment of one or both of the 10 ohm resistors. Note that the whole of this bridge rectifier, smoothing, and Zener diode circuit is tied to the -350V rail (Cathode of klystron) and must therefore be well insulated from the earthed chassis.

The low voltage winding on T1 is fed to a voltage doubling bridge rectifier which provides supplies of about +22V and -22V with respect to earth. After further smoothing and regulation these supplies are used for all the transistors in the equipment. Under 100mA is drawn from each supply.

Providing reasonable sized heatsinks are used for the four power transistors and the five zener diodes, the power supply will run quite cool.

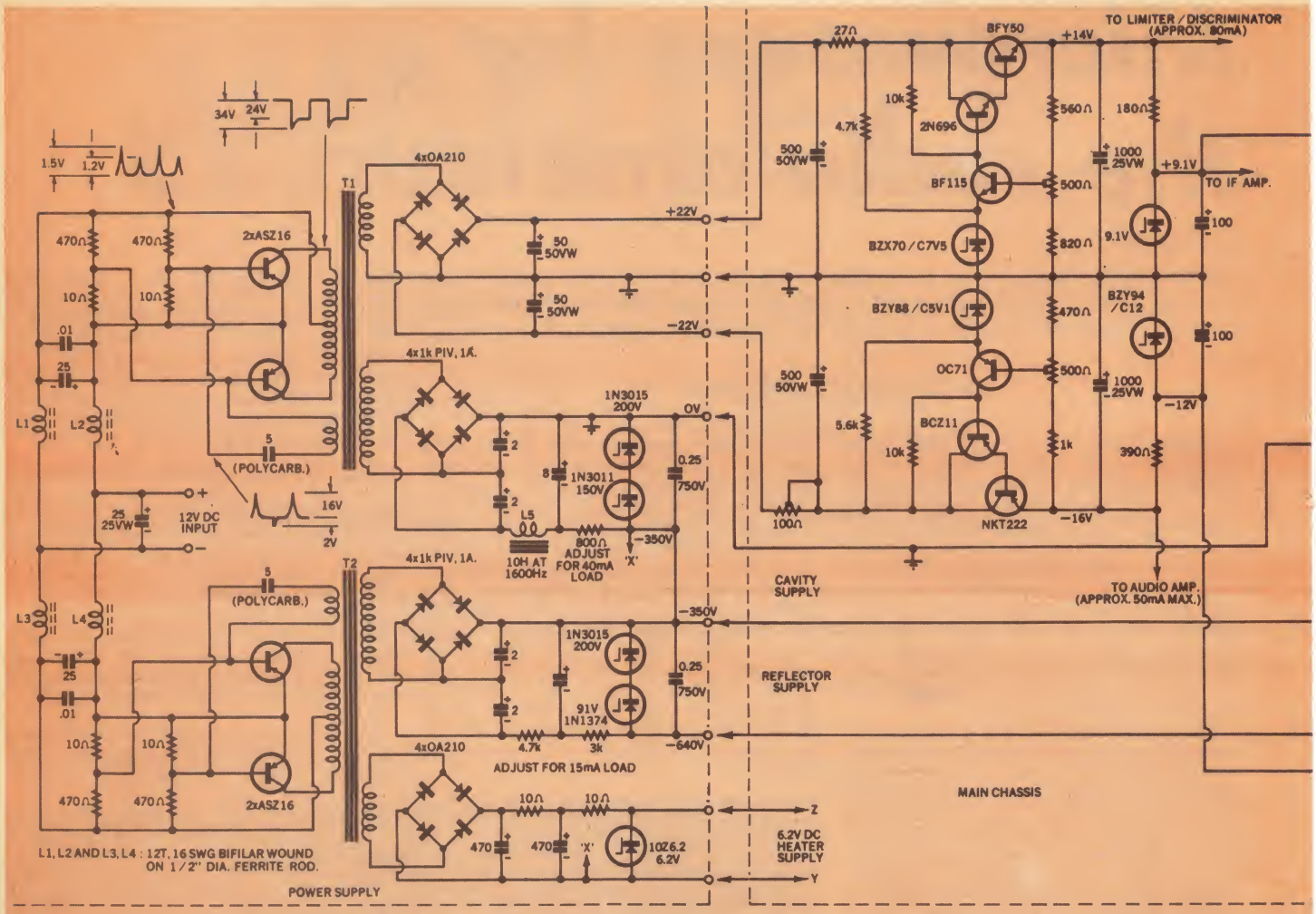
The main electronic assembly serves several purposes, a very important one

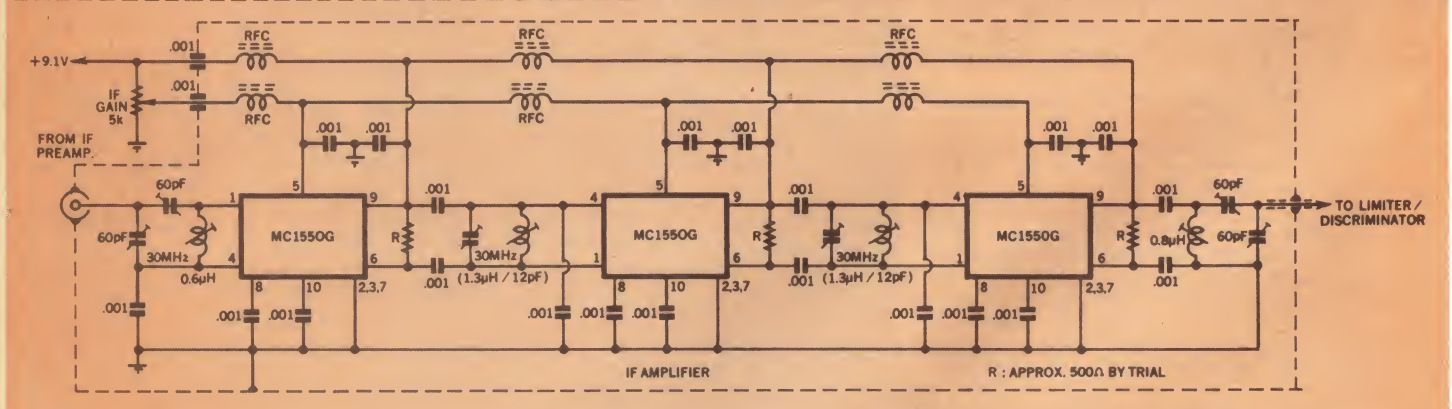


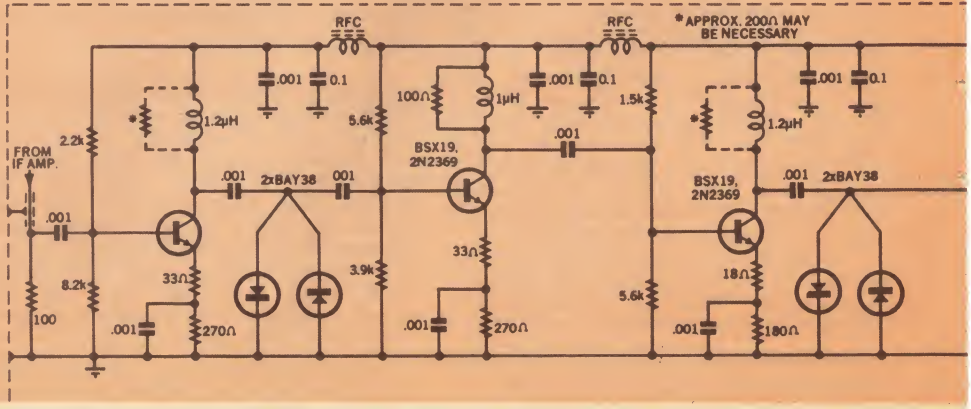
The cascode IF preamplifier used in the author's prototype 10,000MHz station. This may be used as an alternative to that shown overleaf.

The full circuit diagram of the 10,000MHz station being described by the author in these articles is shown overleaf.

*12 Romford Rd, Frenchs Forest 2086







4xASZ16 MOUNTED ON 1/4" AL. HEATSINK

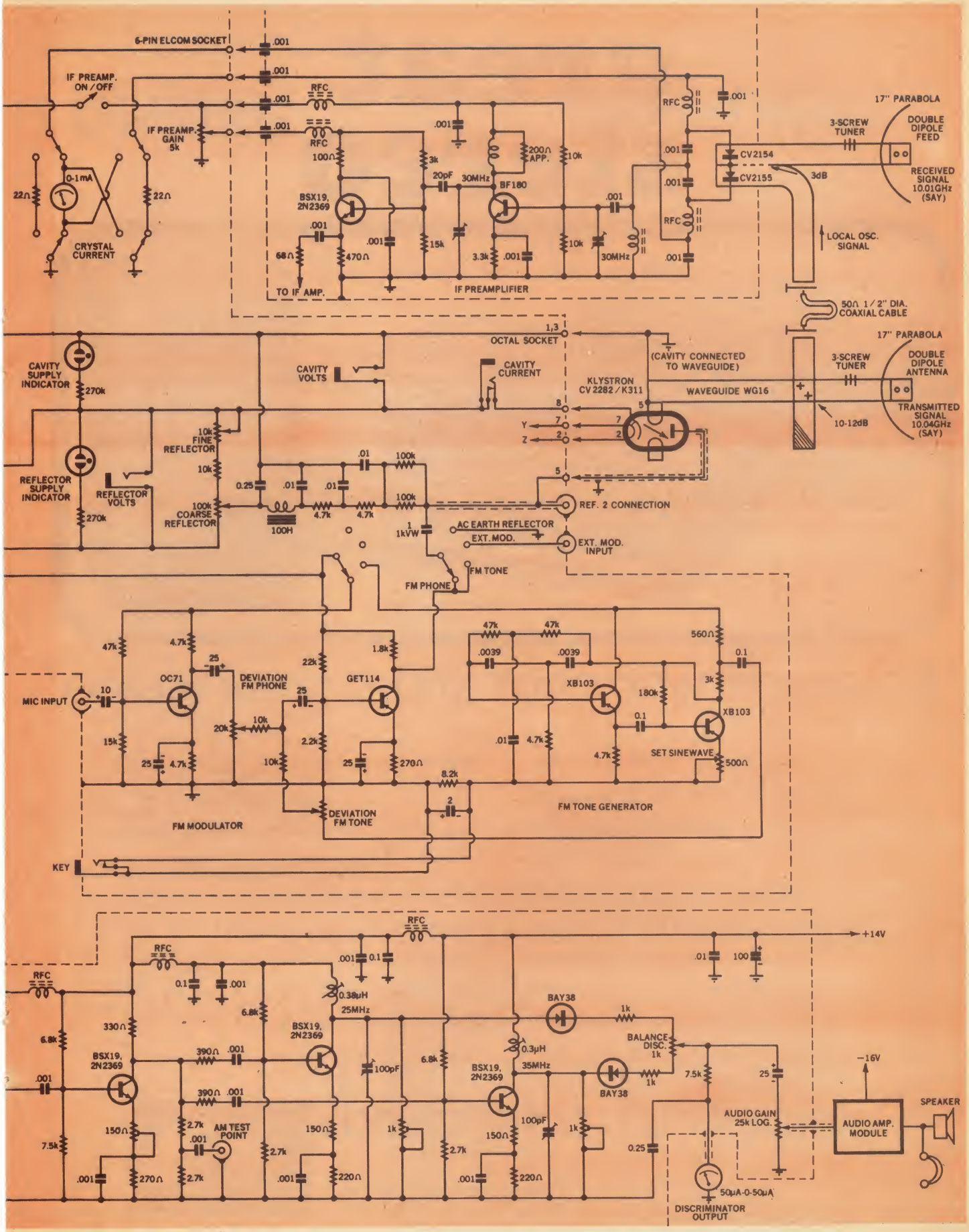
5x ZENER DIODES IN POWER SUPPLY MOUNTED ON 1/4" AL. HEATSINK

CAVITY SUPPLY ZENER DIODES SHOWN FOR OPERATION OF K311 OR CV2282 KLYSTRONS. USE 280V FOR 732A/B OR CV1792 KLYSTRONS

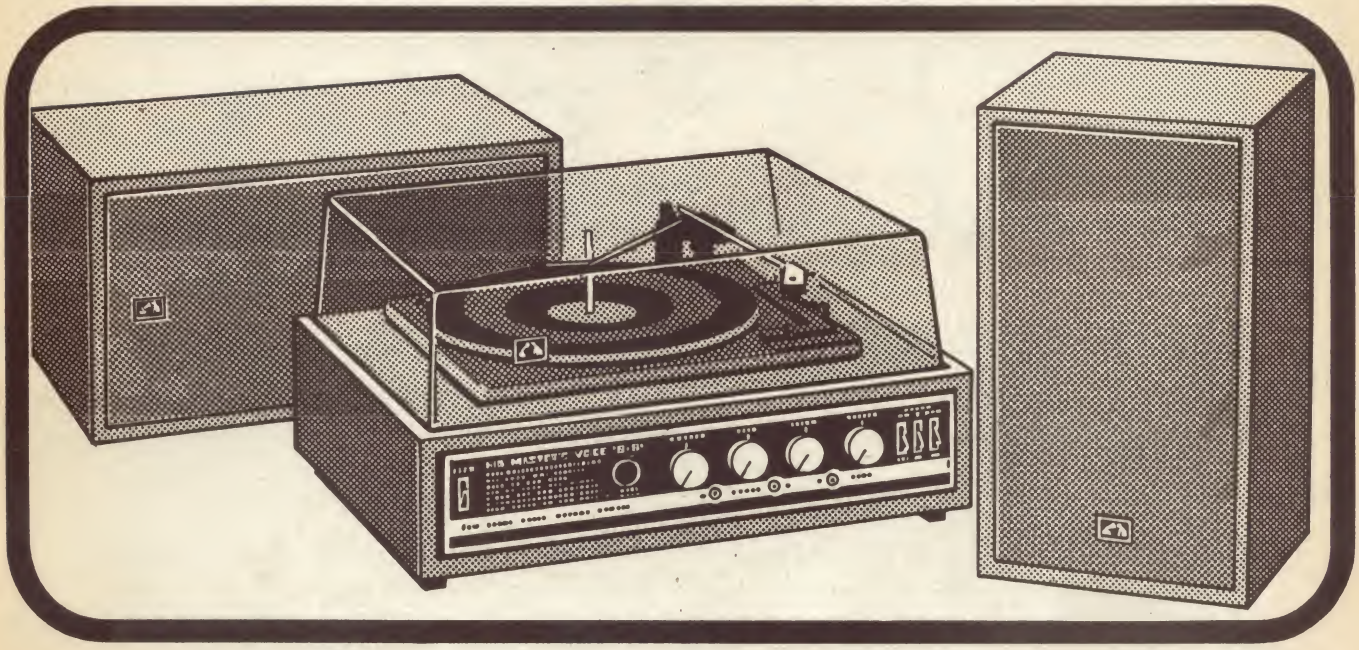
IF BF115s ARE USED IN LIMITER/DISCRIMINATOR ADJUST BIASING SO THAT EACH STAGE DRAWS 5mA. EARTH CANS OF BF115s BUT NOT BSX19/2N2369s.

RFC : 3T ON FX1115 BEAD

10GHz TRANSMITTER/RECEIVER


6-PIN ELCOM SOCKET
IF PREAMP. ON/OFF
IF PREAMP. GAIN 5k
0-1mA
CRYSTAL CURRENT
22Ω
RFC
100Ω
BSX19, 2N2369
BF180
30MHz
200Ω APP.
20pF
3k
15k
3.3k
10k
68Ω
470Ω
TO IF AMP.
IF PREAMPLIFIER
CV2154
CV2155
3dB
17" PARABOLA
3-SCREW TUNER
DOUBLE DIPOLE FEED
RECEIVED SIGNAL 10.01GHz (SAY)
LOCAL OSC. SIGNAL
50Ω 1/2" DIA. COAXIAL CABLE
OCTAL SOCKET
CAVITY SUPPLY INDICATOR
CAVITY VOLTS
CAVITY CURRENT
(CAVITY CONNECTED TO WAVEGUIDE)
KLYSTRON CV2282/K311
WAVEGUIDE WG16
10-12dB
TRANSMITTED SIGNAL 10.04GHz (SAY)
REFLECTOR SUPPLY INDICATOR
REFLECTOR VOLTS
FINE REFLECTOR
COARSE REFLECTOR
100H
REF. 2 CONNECTION
AC EARTH REFLECTOR
EXT. MOD.
EXT. MOD. INPUT
FM PHONE
FM TONE
MIC INPUT
OC71
GET114
XB103
DEVIATION FM PHONE
DEVIATION FM TONE
SET SINEWAVE
FM MODULATOR
FM TONE GENERATOR
KEY
+14V
BAY38
0.38μH
25MHz
0.3μH
35MHz
100pF
BALANCE DISC. 1k
AM TEST POINT
AUDIO GAIN 25k LOG.
AUDIO AMP. MODULE
SPEAKER
−16V
50μA-0-50μA
DISCRIMINATOR OUTPUT

great stereo



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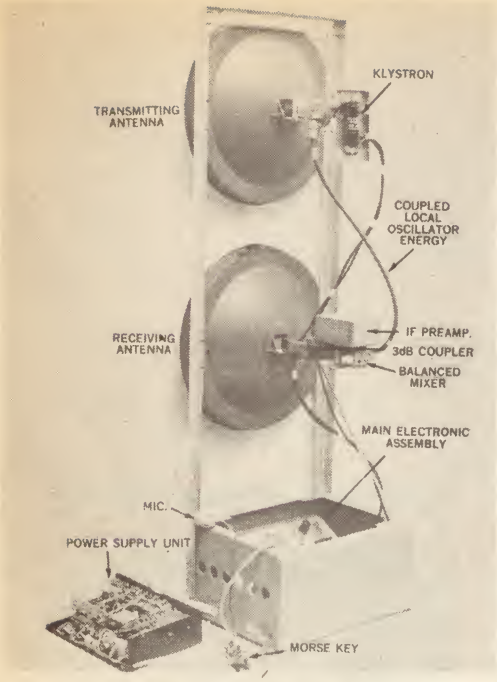

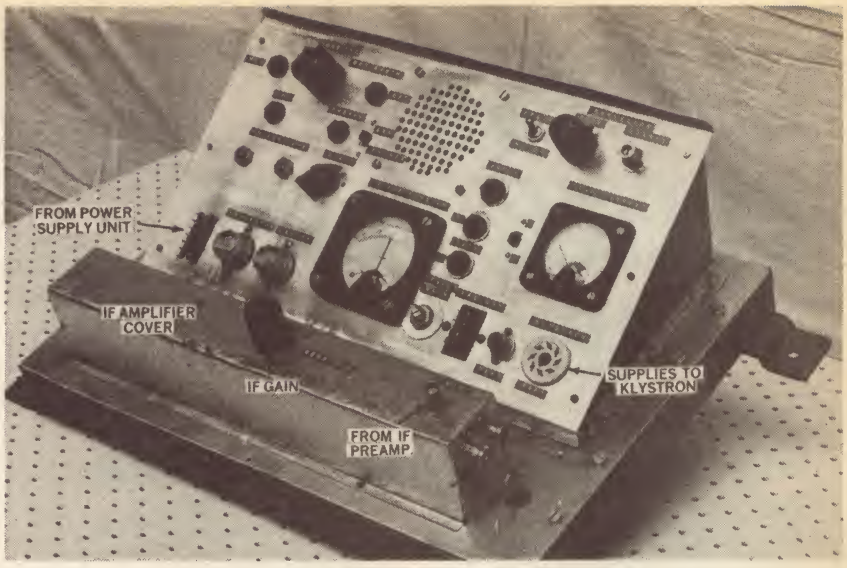

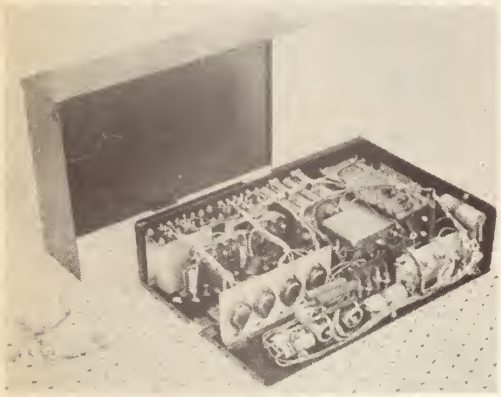

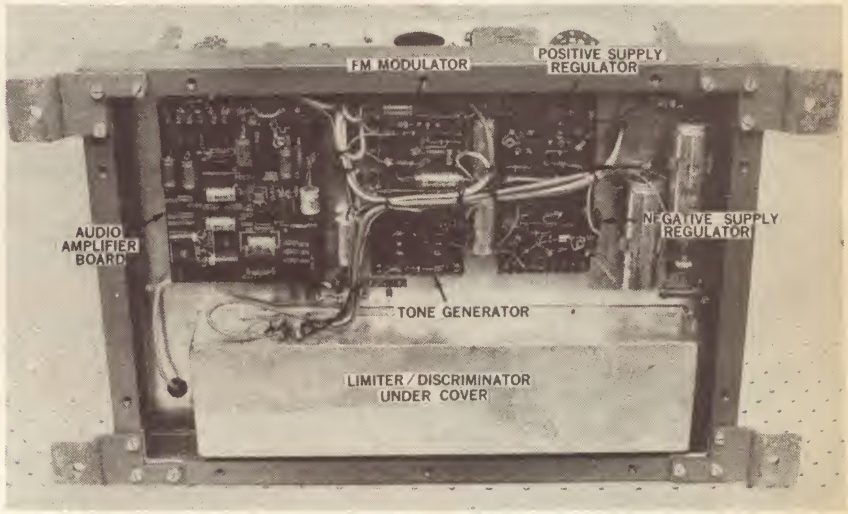

At top left is the complete station, set up for operation, and beneath it is a closeup of the power supply. Upper and lower views of the main electronic assembly are shown at right.

being that it provides a very rigid, but easily removable, support for the framework (made from angle aluminium) holding the two parabolic reflectors. This support is attached to the outer cover of what was a wall mounting electrical unit of unknown origin, obtained from disposals. The outer cover and its added framework are attached to a main base plate and support by four DZUS fasteners. A flat aluminium chassis covers the open centre of this base plate and now houses, on its underside, two stabiliser units for the low voltage supplies, the modulator and tone generator of the transmitter, and the audio amplifier module and the limiter discriminator unit of the receiver.

The upper face of this chassis houses the IF amplifier of the receiver, and an angled panel which houses all the controls, meter and connections of the system. These are accessible through a removable top plate, which completes the outer cover. The connections to the klystron and the mixer / IF preamplifier, which are mounted at the rear of the parabolic antennae, and to the power unit, are all made through this removable top plate. A surplus gun siting telescope is mounted on the angle framework, and is used for initial alignment of the microwave link.

The electronic modules of the main assembly are as follows.

+14V Stabiliser. This is a very simple and conventional regulator which is fed with +22V from the power supply unit, and provides a pre-set voltage at +14V which is permanently connected to the limiter discriminator of the receiver. A second output of +9.1V is derived from a zener diode fed from the +14V. This +9.1V supply is used for the IF amplifier and preamp. For convenience during alignment an on / off switch is fitted in the supply to the IF preamp. Both the IF amplifier and the preamp have a potentiometer network across the +9.1V supply. These potentiometers provide manual gain controls. A small heat sink is fitted to the series transistor, a BFY50. The load current is approximately 100 mA.

-16V Stabiliser. This is virtually the same as the +14V stabiliser except that it uses PNP transistors. The stabiliser feeds a permanently connected audio amplifier for the receiver, and, via a zener diode connected to provide -12V, the switched FM 'phone and tone generators. A small heatsink is fitted to the series transistor which in this case is an NKT222. The load current of the -16V Stabiliser is between 50 mA and 75 mA depending on the audio output.

The only reason for using a -16V stabiliser was that the writer had a complete audio amplifier unit ex a dictating machine. As it was desired to use this, it was decided to operate the modulator from the same supply. If an alternative positive supply audio amplifier were contemplated, then the modulator should also use NPN transistors and run from the +14V Stabiliser. This would make the -16V Stabiliser redundant, and simplify the unit significantly.

The Control Panel. This acts as the distribution board and control panel for the system. Power from the supply is fed to the panel via a really reliable multi way plug (intermittent connections in the reflector leads of klystrons can cost you the valve!). The cavity and heater supplies are routed to a second plug and socket and thence to the klystron. As part of this routing process the cavity voltage and current are fed to insulated metering jacks, and the cavity voltage also is made to illuminate a reasonably large neon lamp. Screened wire

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is used thoughout so as to prevent pickup.

The reflector supply (also screened throughout) is first fed to a potentiometer network providing a coarse variation (-50V to -300V), and a fine electronic tuning control which simply alters the current taken by the potentiometer, and in fact produces a reflector voltage change of about 5V from value determined by the coarse control. The output of this potentiometer is then filtered by an LC section filter consisting of a 100H choke and 0.25uF capacitor followed by a two section RC filter.

Virtually no current is flowing through this filter, which reduces any ripple and stray pick up to a very low value. Audio from either the FM 'phone generator or the FM tone generator, which can be keyed, is fed, via a 1uF 1 kV working capacitor and 50k high stability resistor (in fact 2 x 100k in parallel for safety reasons) and is thus superimposed on the DC reflector voltage. Ripple and stray pick up voltages appear as unwanted modulation and should be eliminated.

A neon similar to that placed across the cavity supply is also fitted across the reflector supply, and mounted adjacent to the other. The purpose of these is again a safety feature. On initial switch on, observe both neons, which should light immediately. If both do not light, switch off immediately and investigate the fault. Providing this observation takes place before the klystron heater warms up, the chances are that the klystron will not have come to grief. A further insulated jack monitors the incoming (full) reflector supply. A coaxial socket, in parallel with the reflector connection through the plug and socket carrying supplies to the klystron, allows the actual reflector voltage and its modulation to be monitored if desired.

The modulation switch has four positions:

1. FM PHONE, by which the output from the two stage amplifier (fed by a microphone ex dictating machine), is fed to be superimposed on the reflector voltage as per Fig 18 curve B. The level is set by the "FM Deviation" pre set, which is arranged so that the average deviation of the 10,000 MHz is about $\pm$2MHz. This is secured by between 3V and 5V of audio.

2. FM TONE, which is again fed by the second stage of the amplifier of (1) above. In the "FM Tone" position the first stage of this amplifier has its HT removed, and a separate 800 Hz sine wave tone generator is energised and has its output fed, via the "FM TONE Deviation" pre-set, to the second amplifier stage. In this way equality of deviation in the two positions is secured. Interaction between the two preset controls is minimised by the two 10K series resistors. The 500 ohm emitter preset resistor (set at about 220 ohms in the writer's unit) in the tone generator is used to secure a good sinewave, and at the same time assists in making the oscillator key well. Keying is performed by the insertion of a large resistor in the HT return of the tone generator.

3. EXT MOD: External modulation, either a low voltage audio suitable for producing FM as previously described, a larger voltage of approximately 15V for producing AM (as per Fig 18 curve A), or an even larger square wave for producing MCW (as per Fig 18 curve C) can be introduced into the "Ext Mod" socket.

4. REFLECTOR EARTHED: In this position the modulator "side" of the 1uF coupling capacitor is earthed, thus earthing the reflector as far as AC is concerned. A large value of this capacitor was necessary to achieve a very low reactance path for this facility, which is very useful in determining how much of any residual unwanted FM is being produced by the reflector. If this facility is not fitted the value of this capacitor can be reduced to about 0.1uF.

Metering. The insulated jacks referred to previously are wired such that no polarity switching of the external multimeter used for the measurement is necessary. Two meters are provided for normal operation of the unit. One reads the discriminator output voltage — this is used for tuning the klystron for a separation of 30 MHz with the incoming signal, ditto from a microwave test signal from a signal generator, or for alignment of both the limiter discriminator and the IF amplifier when these are fed from a tunable signal generator covering 20-40 MHz.

Under all these conditions, when the test signal is in the region of 25 MHz to 35 MHz the meter can be used to indicate that the level is in the limiting region — it becomes the warning of when the limit of microwave communications is being approached. The permanent inclusion of this quite sensitve (50-0-50 uA) meter may seem a little extravagant, but it has more than justified its use in practice.

The second meter is a 0-1 mA movement which is used to indicate the DC crystal current flowing in the microwave mixer, due to the local oscillator injection. One meter, and an associated reversing switch are provided and caters:

(a) In a single mixer — for reading current from two alternative types (polarity) of crystals likely to be encountered.

(b) In a balanced mixer, for reading the current from either of the two active opposite polarity crystals which are used. Under these conditions, in order to maintain the circuit of the crystal current not being measured, (but still in use), a low resistance is inserted in place of the meter. Crystal currents of approximately 0.7 mA are to be aimed at for cartridge IN23B types and 1.0 mA for the coaxial CV2154 / 5 types.

Other Controls. The control panel houses the FM phone and tone deviation controls previously referred to, the Audio Gain control, which is a potentiometer in between the limiter discriminator and the audio amplifier, and the speaker and its associated headphone switch and jack. All leads to these controls are in screened cable, bonded to the chassis except for the screen on the TONE Deviation which is returned to the semi-floating earth return lead. The IF preamp gain control and an 8 pin socket carrying HT and crystal current circuits to the outboard head amplifier is fitted adjacent to the socket carrying supplies to the klystron.

Further details of the system will be given in the next article.

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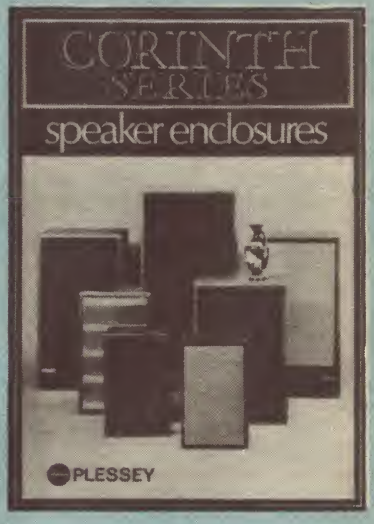

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AR47

CIRCUIT & DESIGN IDEAS

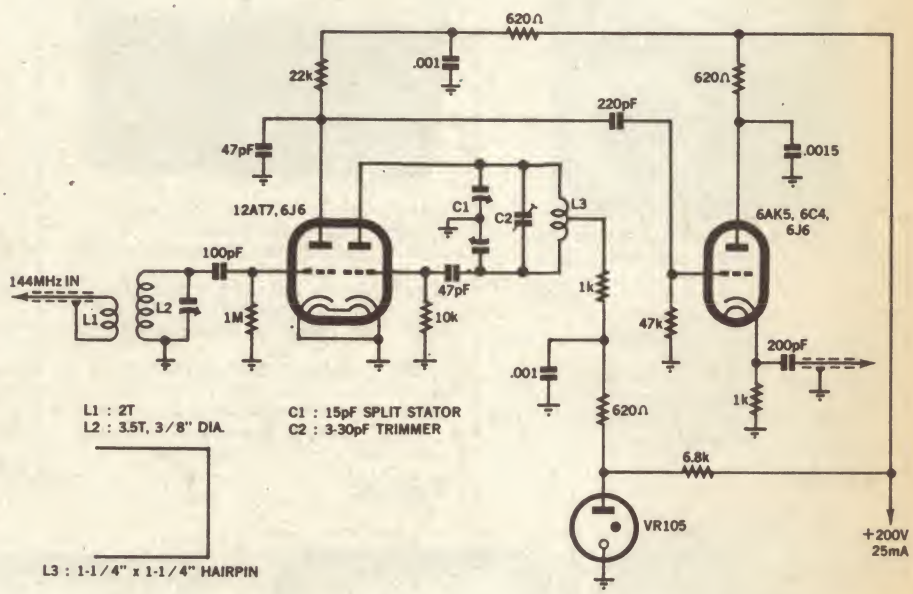
Interesting circuit ideas and design notes selected by the Editor from technical literature, reader contributions and staff jottings. As they have not necessarily been tested in our laboratory, responsibility cannot be accepted. Contributions to this section are always welcome.

A Simple 144MHz Converter

For those interested in being able to listen to the 144-146MHz amateur band, here is a simple two-metre converter that may be built very easily and should work almost as well as the more elaborate crystal-locked converter. The advantage of this little converter as far as the beginner is concerned, is that there are no expensive crystals to buy and it may be used with almost any type of receiver from the broadcast band to about 5MHz. A short wave receiver is not necessary and everyone has a broadcast set.

Perhaps the only component which may be hard to come by is the "butterfly" type variable capacitor. The rest of the parts should present no problems and may be obtained readily, even from the junk box.

One point which is important with this type of converter, is mechanical stability, which vitally affects the frequency stability. This important point can be taken care of by building the unit on a chassis made of tin plate and when bent in the form of a "U", measures 7in long x 5in wide x 2in deep. When initially folded, the sides are 2½in and these are folded inwards, making a ½in lip along each side. The ends and bottom may be covered in with another piece bent up to suit.



(From the "Journal of the Maitland Radio Club".)

Many Uses for PVC Sleeving

PVC sleeving (spaghetti) has been used in the electronics industry for many years, but it is not generally known that it is possible to increase its size quite considerably, slip it into place, and then let it shrink tight. This procedure opens up many new uses. Examples of uses are sleeving on the handles of pliers and sidecutters, to insulate the shaft of screwdrivers, to make water-tight joints between coaxial cable and aerial elements, to terminate cable braid, and many more.

The secret is in the use of dilating fluid. A length of PVC sleeving is cut off and soaked in the fluid for about 30 minutes or so. The tubing swells to about twice its original size. When removed from the fluid, it gradually shrinks back to about its original size. When it is first removed from the fluid it is quite pliable and can be carefully pushed into places where even larger size tubing would be awkward to fit. As it dries it tightens up and makes a remarkably tight finish.

Soaking time is not critical. Lengths of tubing can be left in the fluid to use later as required. The fluid evaporates so a tightly corked bottle or jar with a screw lid is recommended. Drying time is about four hours but overnight is preferable to ensure a tight shrink before use.

The fluid I use is a BALM product called "Dulon lacquer thinner" which I believe is used by automobile painters and should be obtainable through your local BALM agent, if he does not hold it in stock already. One pint is adequate for ham use and would last for ages. A good idea would be for clubs to buy the thinners in bulk and divide it between members.

The soaked tubing is quite slippery and weak and can be readily slipped into place. It may be necessary to lightly bind one end in place with string to prevent the tubing from moving out of position as it dries. The tubing length should be cut longer than required and trimmed to length after it has dried in place.

"Try some" is the recommendation. You will find the method very easy and will soon discover many new applications.

(By Fred Johnson, ZL2AMJ, in "Break In".)

(Editorial Note: Many readers will be familiar with (heat) shrinking plastic sleeving but the problem usually is that this material is not readily available through electronics components outlets. The method described above should be a good alternative and the materials are available.)

Crystal-Controlled Gate-Dip Meter

Dip meters are not known for their precise frequency calibration or frequency stability. A gate-dip meter emphasising stability and calibration accuracy is described. It has all of the performance characteristics of a conventional grid-dip meter together with the capability for crystal control and being battery operated it is also portable.

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DC/A	: 50μA 2.5mA 250mA
OHM	: 6kΩ 6MΩ
Capacitance	: 100pF to .01μF.001μF to 0.1μF
db	: −20db to +22db
Audio Output	: 10V 50V 100V 500V 1,000V AC
Approx. size	: 4½" x 3¼" x 1-1/8"

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A-10/P. Giant 6½" Meter. Inbuilt signal injector. Overload-Protected.

AC/V	: 2.5V 10V 50V 250V 500V 1,000V (10,000Ω/V)
DC/V	: 0.5V 2.5V 10V 50V 250V 500V 1,000V at 30,000Ω/V 5,000V (10,000Ω/V)
DC/A	: 50μA 1mA 50mA 250mA 1A 10A
AC/A	: 1A 10A
OHMS	: 10kΩ 100kΩ 1MΩ 100MΩ
db	: −20 to +62db
Signal Injector	: Blocking oscillator circuit with a 2SA102 transistor
Approx. size	: 6-2/5" x 7-1/5" x 3-3/5"

$60.00

CT-500/P. Popular, medium-size, mirror scale. Overload-Protected.

AC/V	: 10V 50V 250V 500V 1,000V (10,000Ω/V)
DC/V	: 2.5V 10V 50V 250V 500V 5,000V (20,000Ω/V)
DC/A	: 0.05mA 5mA 50mA 500mA
OHM	: 12kΩ 120kΩ 1.2MΩ 12MΩ
db	: −20db to +62db
Approx. size	: 5½" x 3-5/8" x 1¾"

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M-650/P. Plastic dial cover. Mirror scale. Overload-Protected.

AC/V	: 6V 30V 120V 300V 1,200V (15,000Ω/V)
DC/V	: 3V 12V 60V 300V 600V 1,200V (50,000Ω/V)
DC/A	: 30μA 6mA 60mA 600mA
OHM	: 16kΩ 160kΩ 1.6MΩ 16MΩ
db	: −20 to +63db
Approx. size	: 5¼" x 3½" x 1¼"

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370W/P. Bench model. Overload-Protected.

AC/V	: 2.5V 10V 50V 250V 500V 1,000V (4,000Ω/V)
DC/V	: 0.5V 2.5V 10V 50V 250V 500V 1,000V (20,000Ω/V)
DC/A	: 50μA 1mA 10mA 100mA 1A 10A
AC/A	: 100mA 1A 10A
OHM	: 5kΩ 50kΩ 500kΩ 5MΩ 50MΩ
db	: −20db to +62db
Approx. size	: 7" x 5¼" x 3-1/8"

$57.50

OL-64D/P. Popularly priced model, rugged construction. Overload-Protected.

AC/V	: 10V 50V 250V 1000V
DC/V	: 0.3V 1V 10V 50V 250V 500V 1000V 5000V
DC/A	: 50μA 1mA 50mA 500mA 10A
OHM	: 4kΩ 400kΩ 4MΩ 40MΩ
db	: −20 to +62db
Approx. size	: 6" x 4-1/5" x 2"

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AS-100D/P. High 100,000 Ω/Volt sensitivity on DC. Mirror scale. Protected-movement.

AC/V	: 6V 30V 120V 300V 600V 1200V (10,000Ω/V)
DC/V	: 3V 12V 60V 120V 300V 600V 1,200V (100,000Ω/V)
DC/A	: 10μA 6mA 60mA 300mA 12A
OHM	: 2kΩ 200kΩ 20MΩ 200MΩ
db	: −20 to +57db
Audio Output	: 6V 30V 120V 300V 600V 1,200V AC
Approx. size	: 7½" x 5½" x 2¾"

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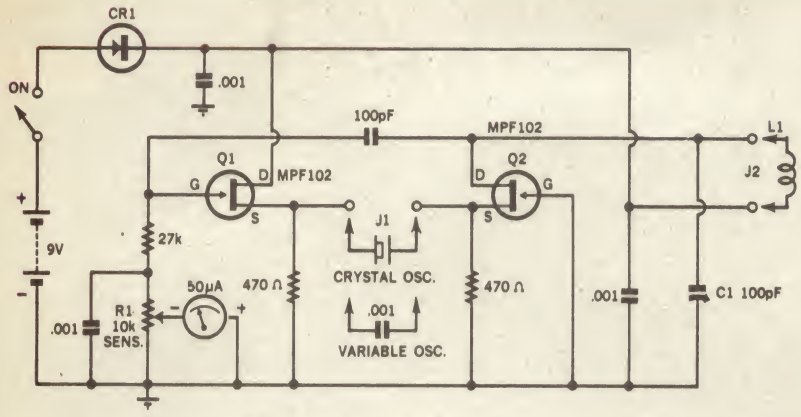


Either a .001uF capacitor or a quartz crystal (operated in series mode) completes the feedback loop and causes the circuit to oscillate. The resonant frequency of L1 and C1 determines the frequency of oscillation when the coupling capacitor is used. When a quartz crystal is used instead and the tuned circuit L1C1 is tuned to the series-resonant frequency of the crystal (fundamental or overtone) the oscillator will be crystal controlled.

When an external tuned circuit is brought close to L1 and is tuned to the dipper frequency, some of the RF power of the dipper will be coupled to the external circuit, the current through the meter will be reduced. The potentiometer is used to adjust the meter reading to occupy the upper half of the meter scale. Tuning capacitor C1 is a single-section, grounded-rotor unit. The circuit operates over the frequency range of 2.9 to 155MHz, using the coil set as described in the table.

With the .001uF capacitor in place the dipper operates like a conventional dip meter inasmuch as resonance of the external circuit is indicated by a dip in meter current. When crystal control of the oscillator frequency is desired, the .001uF capacitor is replaced by a quartz crystal and the appropriate coil is inserted at J2. C1 is tuned for maximum meter current. Oscillation will take place only when the crystal is operating in a series-resonant mode. Since most crystals are calibrated for parallel resonance, the frequency will be several kHz lower than marked on the holder. Coupling an external circuit to coil L1 that is resonant at the frequency of oscillation will clause a dip in meter current.

The gate-dip meter is contained in a 5¼in x 3in x 2⅛in Minibox. A saddle-mount, 6-pin transistor socket is mounted on an L bracket permitting short leads between various components. When the gate-dip meter is used as an absorption wavemeter, battery power must remain on. The solid-state circuit performs well as a dip meter but is somewhat insensitive when operated as an absorption wavemeter.

COIL DATA Freq Range	Turns on Blank FT-243 Crystal Holder
2.9-5.9MHz	65 turns 30B&S enamel
5.2-10.8MHz	40 turns 30B&S enamel
8.1-17MHz	20 turns 22B&S enamel
16.5-34MHz	7 turns 22B&S enamel
33-71MHz	3 turns 22B&S enamel
70-155MHz	Hairpin loop inside crystal compartment

(Extract from an article by Willie L. Steed, K4PRL, in "QST".)

Printed Board Etching Hint

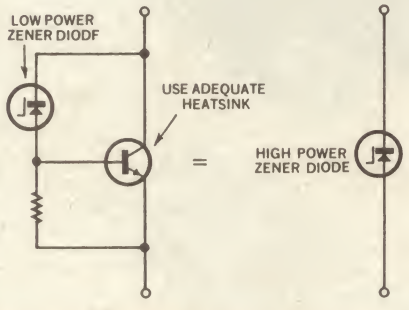
I note on page 59 of the March, 1972 issue of "Electronics Australia", that Mr Fred Johnson gives details of etching "painted" circuits. I read somewhere that research shows that etching is quicker if the board is placed upside down in the ferric chloride. This way, the insoluble reaction products fall away from the board. I have tried this and it works out very well. However, best results are obtained if the board is placed copper up for the first minute or so.

The board will float on the surface due to surface tension, if no wetting agent is used. A little washing-up liquid added to the bath helps as a wetting agent, eliminating bubbles under the board. Be careful not to use too much washing-up liquid, as the purpose will be defeated by actually causing more bubbles to form on the copper surface.

(By Mr Robin A. Hoare, 38 Dreadon Road, Manurewa, New Zealand.)

Economy High-Power Zener Diode

Small zener diodes and power transistors are now cheap but big zeners are still dear, especially for high voltages. A small zener diode, a resistor and a well heat-sunk power transistor arranged as shown, constitutes a two-terminal device equivalent to a zener diode with the dissipation rating of the transistor. The resistor keeps down the leakage current when V.is less than Vz and is not critical in value and not always necessary.



Something was needed to clip at about 150 volts the commutation pulses getting through to the output of an SCR inverter. One-watt and some 10-watt zener diodes failed even though average dissipation was low, but a type 40322 transistor (35W, 300V) with a 1-watt, 150V zener and a 1k resistor stood up OK. (By Albert H. Taylor, in "Radio-Electronics".)

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Key Handles. Handles are available either in a standard black with ivory insert or from a choice of many self-colours with contrasting tip inserts to provide easy identification.

Reliability. Extended life tests have indicated negligible wear or loss of contact pressure after one million operations.

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A standardised range is available ex stock. Literature is available on request to the Professional Components Unit.

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AD47

Building a Superhet Receiver

Here is an ideal project to build up in order to reinforce the knowledge you have gained in the previous chapters. It is a simple superhet radio receiver of modern design, battery operated and with its own loudspeaker. The circuit uses six bipolar transistors and a FET, and is built on a printed wiring board to give you experience with this widely-used construction technique.

Having studied various aspects of electronics as applied to radio receivers in previous chapters, together with the construction of simple receivers in Chapter 12, you are now in a position to tackle a more involved type of receiver using the superheterodyne principle. Perhaps it may be wise to refresh your theory of operation of the superheterodyne before proceeding, by referring back to chapter 13.

Although superheterodyne receivers can often be very complex affairs, nevertheless it is possible to design quite a simple version. With this in mind, we will discuss details of a simple superhet (for short) and show how it may be built quite easily. It must be pointed out here that although the receiver to be described is simple, it embodies all the basic superhet principles.

As you may well have gathered by now, the superhet principle applies only to the sections or stages of a receiver up to and including the detector. The signal emerging from the detector is the wanted audio in the form of speech or music at low level. So that the audio signal may be used to drive a loudspeaker, it is necessary to amplify the signal and this is done in the audio amplifier, which is another essential part of a complete receiver. A modern audio amplifier is incorporated into this receiver and it is sufficient to drive a loudspeaker to a level adequate for normal listening purposes.

The other essential part to complete the receiver is a power supply. In its simplest form, this can be a suitable battery and this is the type of supply which we have used here. By taking this approach, we are able to avoid the use of a mains power supply, which has the advantages of reduced initial cost and the avoidance of any hazards which may attend the use of mains power by a novice. Hum problems are reduced to vanishing point, and the receiver may also be operated where no mains supply is available.

Having dispensed with the preliminaries, we shall now take a look at the complete circuit and discuss it in some detail. It will be seen that there are seven transistors in all, with only three of them in the "tuner" and the other four in the audio amplifier system.

The first stage which the signals meet after entering from the aerial is an RF amplifier and it uses an N-channel junction FET, either a Motorola 2N5485 or a Fairchild FE5485. A FET was chosen in preference to a bipolar transistor for this stage, on grounds of circuit simplicity.

In the gate circuit is a conventional type of miniature aerial coil. This coil is type No S203, made by Aegis Pty Ltd. It may also be seen that there is a 220pF capacitor from the top of the primary winding of the coil, to the tap on the secondary winding. This has been added to increase the coupling, more particularly at the high frequency end of the RF band.

In many receivers which have an RF amplifier, the output as well as the input of this stage is tuned. However, on the score of simplicity, we have not tuned the output. Instead, the drain of the FET is fed via a 2.5mH RF choke. The output of the RF amplifier, at the drain of the FET, is a high impedance and the input to the next stage is a relatively low impedance. To meet this situation, we must devise some sort of matching arrangement.

This problem has been solved by connecting two capacitors in series, across the RF choke. By arranging the correct ratio between the two capacitor values, an impedance transformation is achieved at the junction of the two capacitors. From this point, the signal is fed directly to the base of the next stage.

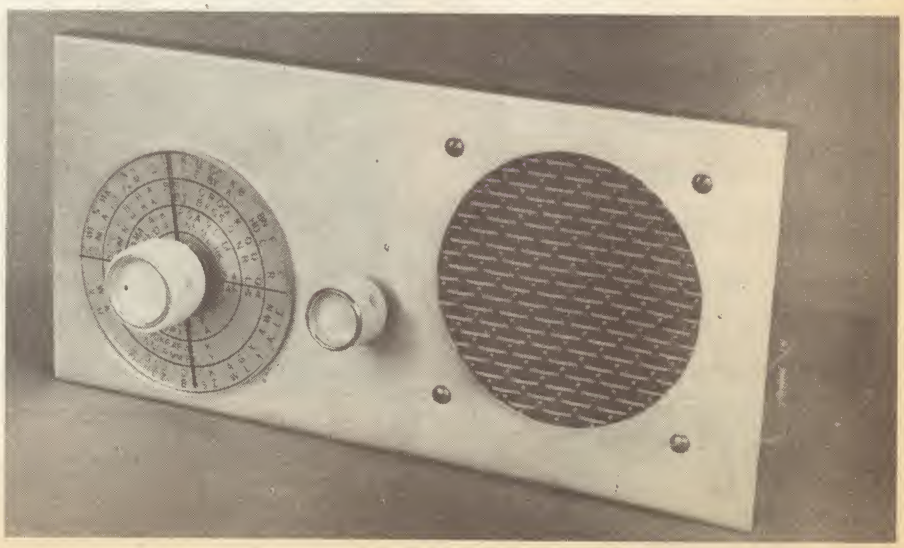
In order to provide a standing negative bias for the gate of the FET, with respect to the source, a resistor is placed between the source and earth and the voltage drop across this resistor is effectively the bias for the stage. Generally, there is a capacitor across such a resistor, to provide a low impedance path for the signal. However, in this case, the capacitor has been omitted so that negative feedback or degeneration is introduced. Also, the value of the resistor is larger than the optimum value for maximum gain. Again, this has been done to increase the amount of degeneration.

At this stage, it may well be asked, why all the degeneration in the RF amplifier, which reduces the gain? The answer is that a compromise must be reached between conflicting requirements. While maximum gain is desirable, there is another consideration which must also be met.

It will be explained later that automatic gain control (AGC) voltage is applied to the gate of the RF amplifier and the RF amplifier is followed by a self-oscillating mixer. Now the varying AGC voltage causes a change in capacitance at the output of the RF amplifier and this change is seen by the following mixer stage. The capacitance change tends to cause corresponding mixer oscillator frequency changes, and this cannot be tolerated as it upsets the tuning of the receiver. By introducing the degeneration previously referred to, the effect is reduced to a minimum.

As mentioned earlier, the next stage is a self-oscillating mixer, also called an "autodyne". One transistor, which is a bipolar type BF115, TT1002, SE1002, etc, performs the dual task of oscillator and mixer. In order to achieve this, the circuit is rather interesting, as even a casual glance will indicate.

The transistor is biased in the usual way, with a voltage divider in the base circuit and a bypassed resistor in the emitter circuit. A special oscillator coil has been designed for this arrangement. There is the usual winding tuned by one section of the gang, together with two small windings to



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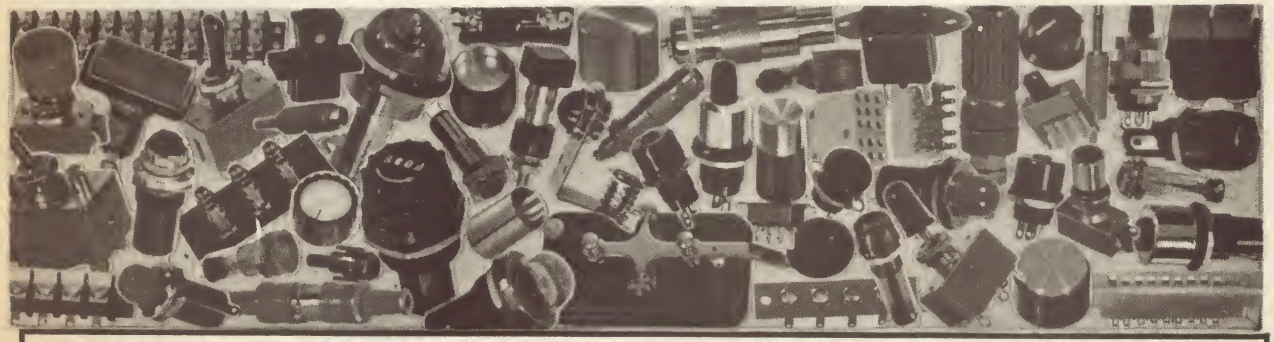

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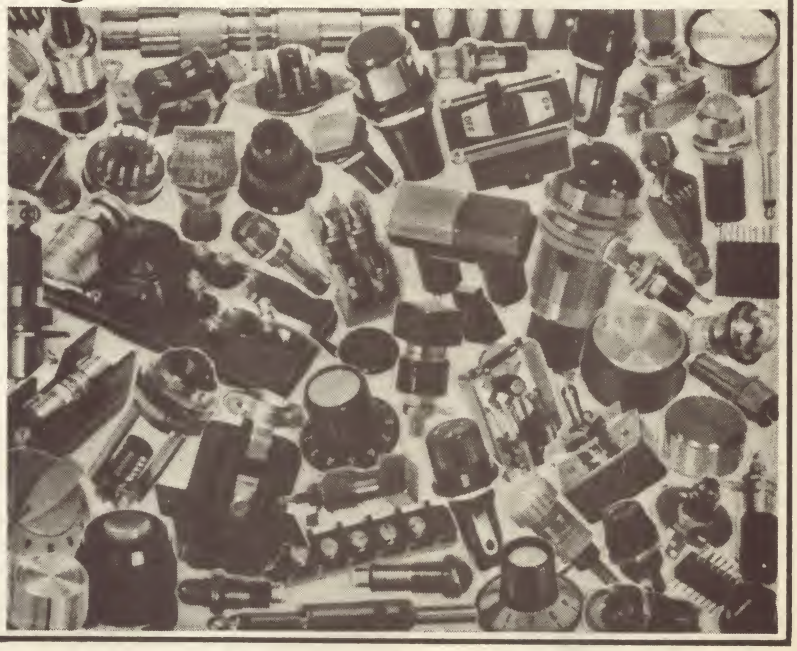

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provide feedback between collector and emitter. It will be seen that these windings are connected in series with the collector and emitter, respectively.

To complete the oscillator circuit, the base of the transistor should be earthed to AC, although not to DC. This can be met by placing a bypass capacitor from base to earth. However, if we use a large value of capacitance, with a very small reactance, for this purpose, the oscillator requirement will be met but the wanted signal from the RF stage would be short-circuited, preventing the stage from acting as a mixer.

Once again, we must compromise but fortunately this can be done quite easily, without detriment to performance. In order to get the oscillator to function satisfactorily, it is not necessary to bypass the base with a very large capacitor. It is possible to arrive at a capacitance value which will bypass the base sufficiently to allow proper oscillator operation and still permit the signal to be fed into the base.

If we take a careful look at the circuit, it will be seen that the base of the autodyne is bypassed by the .0022uF capacitor at the RF choke, and the 0.1uF capacitor from the +9V line to earth. These two capacitors are effectively in series for this function. It may be remembered that the .0022uF capacitor is part of the voltage divider across the RF choke, mentioned earlier. This same capacitor also performs a third function of DC blocking between the drain of the RF amplifier and the base of the autodyne.

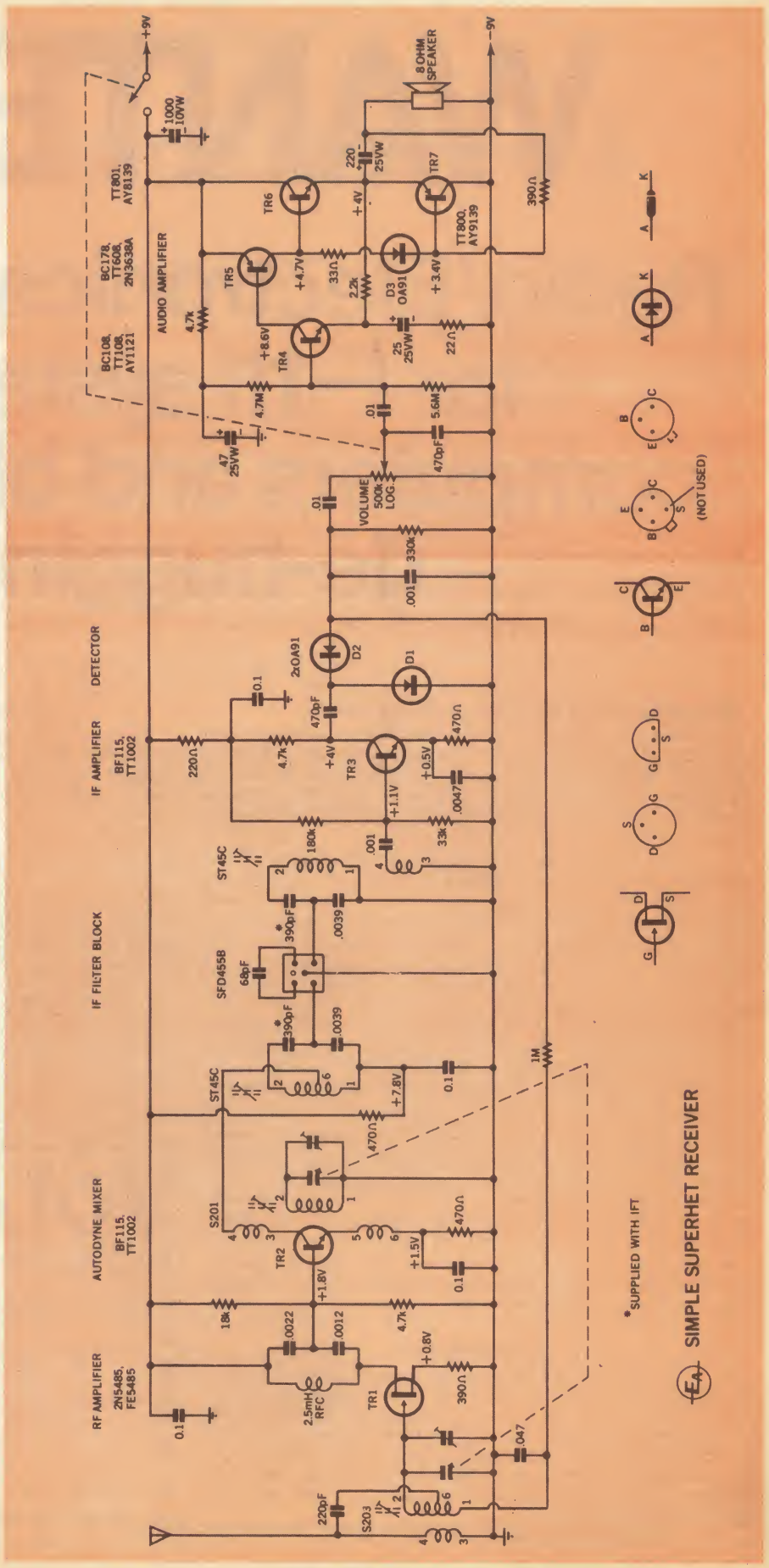
The circuit requires a 2-gang variable capacitor, with one section designed for an oscillator incorporating the padderless technique. This section has a lower maximum capacitance and consequently smaller plates. It will be noted that we have actually used a 3-gang unit, 200pF-90pF-200pF, made by Roblan. This was chosen because it was most physically suited to our purpose and the extra cost was only slight. The extra 200pF section is left unused.

So far, we have considered the function of the mixer as an oscillator, and the wanted signal at its base. You have read in an earlier chapter about the process of frequency conversion of the incoming signal, to an "intermediate frequency" (IF). The IF we are using is nominally 455KHz.

This means that as well as the oscillator and RF signals at the collector of the autodyne, there will also be a 455KHz component. So that the latter may be separated out and fed into the succeeding stages, the first IF transformer primary is connected in series with the oscillator coil winding in the collector circuit. As the IF transformer winding is tuned to the wanted 455KHz frequency, this component is accepted and the oscillator and signal components rejected.

This has brought us to a very important section of the receiver, and where most of the selectivity is realised. Two IF transformers, intercoupled with a two section ceramic filter, form a complete "filter block." We have already explained that the tuned winding of the first IF transformer is connected into the collector circuit of the autodyne stage. For reasons which should become apparent, the low impedance winding of this first IF transformer is left unused.

Now the impedance of the IF transformer is high and the input of the ceramic filter



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To get this flying start to life you must be physically fit to RAAF standards and be an Australian citizen or resident British subject who will be over 15 but under 17 years of age on 1st January, 1973. You should have completed, or be in the process of completing, three years of secondary studies (W.A., S.A. and Qld.) or four years (N.S.W., A.C.T., Vic. and Tas.) studying Mathematics and Science which must contain some Physics content.

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AFAP13.FP.52

into which the transformer feeds is a relatively low impedance. We have a very similar situation here that we had when we had to couple between the RF amplifier and the input of the oscillator-mixer, and although different values of capacitance are used, the matching system used is the same. In this case the total capacitance across the winding has a value which will allow the transformer to be tuned to 455KHz and the ratio of the two capacitances is chosen to give the right impedance transformation.

The ceramic filter consists of two sections, and it is necessary to provide coupling between the two sections. This is done with a 68pF capacitor. The value of this capacitor, within definite limits, determines the bandwidth of the ceramic filter assembly. Increasing the capacitance up to 150pF increases the bandwidth and reducing it to 27pF reduces the bandwidth. The value we have chosen is about right for our purpose.

Coupling from the output of the ceramic filter into the tuned winding of the second IF transformer is done in the same way as before. This brings us to the point where we have to couple from the filter block into the base of the IF amplifier, which again is a relatively low impedance. As menioned before, there is a low impedance winding provided on the IF transformer for this purpose. A look at the circuit will show just how this is done.

The two IF transformers (type ST45C) and the oscillator coil (type S201), like the aerial coil mentioned earlier, are made by Aegis Pty Ltd. The ceramic filter is type SFD455B, made by the Japanese firm Murata and imported by IRH Components Pty Ltd.

The IF amplifier is a conventional bipolar transistor amplifier and there are only a couple of points of interest as far as we are concerned. Although it is used as an IF amplifier, the collector circuit is not tuned and consists simply of a 4.7k resistive load. It will also be noted that the collector circuit is decoupled with a 220 ohm resistor and a 0.1uF capacitor. This is done to prevent any possibility of IF signals being fed back into earlier stages via the power supply line, which would cause instability.

The detector follows, and is quite an interesting circuit. Two germanium diodes are used and they are connected in a half-wave voltage-doubler rectifier circuit. The IF amplifier transistor takes the place of the usual transformer and the 470pF and .001uF capacitors perform the functions of doubling and filtering. The 330k resistor forms a load for the circuit and the rectified 455KHz signal appears across the 330k load. This takes the form of a DC voltage, together with the audio signal recovered from the modulation. The advantage of using the voltage doubler type of detector is that we get almost twice the recovered audio compared with a single diode detector.

The DC voltage which accompanies the audio is also greater than that from a single diode detector. As this voltage varies in level according to the signal strength, it is possible to use it for automatic gain control (AGC). The gain of the FET in the RF amplifier may be controlled by feeding a negative voltage to its gate. By connecting the two diodes in the detector the right way around, we can make them produce a negative DC voltage across the 330k resistor.

As mentioned before, this DC voltage has the audio superimposed on it. Before the DC voltage can be used for AGC purposes, the audio component must be removed and this is done with a simple filter consisting of a series 1M resistor and a .047uF capacitor. This capacitor performs the dual role of filter and a low impedance path to earth for the secondary winding of the aerial coil. Thus, the DC control voltage for AGC action is fed from the detector output to the gate of the FET, via the 1M resistor and the secondary of the aerial coil.

As the audio output from the detector is not sufficient to drive a loudspeaker, it must be amplified in an audio amplifier system. So the audio from the detector is fed through a volume control into an audio amplifier consisting of three stages. The battery On / Off switch is mounted on the back of the volume control.

The audio amplifier circuit is quite straightforward and in line with modern design. It is transformerless and uses a complementary-symmetry PNP-NPN pair of silicon transistors in the output stage. Two more silicon transistors, and NPN and PNP, are direct coupled and form a high gain system to drive the output pair. DC feedback of 100 per cent is achieved through the 2.2k resistor, to stabilise the operating current. AC negative feedback is also applied via the same resistor, but can be controlled over a wide range by varying the value of the resistor in series with the 25uF capacitor. The input impedance of the stage following the volume control is high, in the order of a megohm or so, and is largely dependent upon the degree of negative feedback adopted.

The output transistors are operated in class B, with a consequent low value of quiescent current. In its simplest form, the bases of the transistors of this type of output stage are tied together. This can lead to some "crossover" distortion, particularly at low levels. To avoid this, we have introduced a 33 ohm resistor and an OA91 germanium diode in series, between the transistor bases. This sets up the bias such that crossover distortion is avoided and is well worth the slight increase in cost.

The voltage at the emitters of the output transistors should be as close as possible to half the supply voltage, to ensure that the amplifier can deliver full output without premature clipping. As the three stages in the main amplifier are DC coupled, this voltage is determined mainly by the voltage divider at the base of the stage following the volume control. It may be necessary to adjust the value of the resistor shown as 4.7M if the voltage at the output emitters is not approximately +4.5V when the set is first switched on.

The loudspeaker is fed from the output transistor emitters via a DC blocking capacitor — a 220uF electrolytic. For our requirements, this value is sufficient as we are only driving a small speaker. If we had to consider a much larger speaker in a system where good bass response would be expected, then the capacitor would have to be larger, up to 1000uF or so.

The speaker we have chosen is a type 3U made by Magnavox, with an 8 ohm voice coil. A similar speaker with a 15 ohm voice coil may be used but somewhat less volume will be available. Other brands of speaker with similar characteristics to the one we used would be quite suitable.

The 9V battery is an Eveready type 2364.

You will need these parts

1 Chassis-panel, 9in long x 4¼in high x 5in deep
2 Terminals, 1-red, 1-black
1 Dial, Roblan 6 / 1, with knob
1 Knob to match, for volume control
6 Spacers, ½in long x ¼in dia, tapped ⅛in Whitworth
1 Speaker, 3in, 8 ohms
1 Battery, 9V type 2364 or similar
1 Battery plug
1 Printed board, 72 / R9, 7in x 3in
1 Jabel flexible coupling, ¼in x ¼in
1 Aerial coil, Aegis S203
1 Oscillator coil, Aegis S201
2 IF transformers, Aegis ST45C
1 Murata filter, SFD455B
1 2.5mH RF choke
1 Transistor, 2N5485, FE5485
2 Transistors, BF115, TT1002, SE1002
1 Transistor, BC108, TT108, AY1121
1 Transistor, BC178, TT608, 2N3638A
1 Transistor with heat sink, TT801, AY8139
1 Transistor with heat sink, TT800, AY9139
3 Diodes, OA91
Screws, nuts, hookup wire, solder, etc.

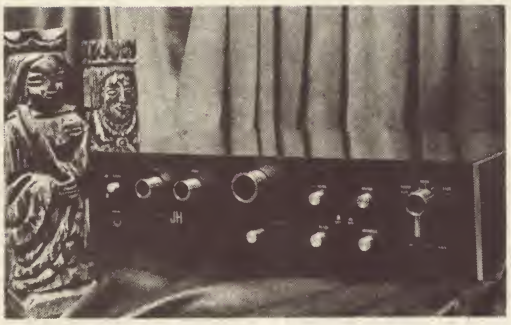
RESISTORS (½ watt)
1 22 ohms
1 33 ohms
1 220 ohms
2 390 ohms
3 470 ohms
1 2.2k
3 4.7k
1 18k
1 33k
1 180k
1 330k
1 Potentiometer, 500k with switch
1 1M
1 4.7M
1 5.6M

CAPACITORS
1 220pF 630V polystyrene
1 3-gang, 200pF-90pF-200pF, Roblan
2 470pF 630V polystyrene
2 .001uF 630V polystyrene
1 .0012uF 400V polyester
1 .0022uF 400V polyester
2 .0039uF 400V polyester
1 .0047uF 25V ceramic
2 .01uF 25V ceramic
1 .047uF 25V ceramic
3 0.1uF 25V ceramic
1 25uF 25VW electrolytic single ended ended
1 47uF 25VW electrolytic single ended
1 220uF 25VW electrolytic single ended
1 1000uF 10VW electrolytic single ended
Note: Resistor wattage ratings and capacitor voltage ratings are those used with our prototype. Components with higher ratings may generally be used providing they are physically compatible. Components with lower ratings may also be used in some cases, providing the ratings are not exceeded.

A "State of the Art" Design

JH STEREO AMPLIFIER

Distributed in Australia, NZ, USA and Canada



Actual power — 50 watts rms (8 ohms)

CHOOSING THE BEST

There is a line in a song — "How does the wine taste — is it good?" A group of connoisseurs can quickly answer this question and they will usually be in agreement.
The choice of an audio amplifier is not quite so simple. The buyer is faced with a glittering array of well packaged products and whatever he selects will only be as satisfying as its performance in his own home in combination with other equipment. It may be days or weeks before he knows whether he has purchased wisely or spent his money on an unnecessary collection of knobs in a glamorous case.

A FACT TO BE FACED

The real truth is to be found in the fundamental fact that good amplifiers are just as rare as good designers and these are rare indeed. Those designers usually have a long queue waiting for custom built amplifiers.

Imagine the difficulty in finding this combination of talents:—

- An electronics graduate with specialised audio engineering background.
- A music lover who regularly attends live concerts.
- Such an individual who has spent a lifetime dedicated to the ideal of translating the sum of science and art in the attempt to approach perfection in the electronic reproduction of the live orchestral sounds.

The buyer who realises just what a problem it is to find such a designer will understand why there are so few audio amplifiers which the real dedicated audiophile would care to buy. The "J.H." amplifier is such a gem that it would be worthwhile standing in a queue, if that were necessary.

BUY "JH" CONFIDENTLY

The technical specifications relating to the JH stereo amplifier are excellent and the performance vastly in excess of any other instrument in the same price bracket. It will provide fatigue free satisfying sound because it has been desinged by a connoisseur (who did have a very long queue).

SPECIFICATIONS

POWER OUTPUT (Total)
Claimed: 40 watts r.m.s. into 8 Ohms
Actual: 50 watts r.m.s. into 8 Ohms
30 watts r.m.s. into 15 Ohms

BANDWIDTH
Above power holds good from 25 — 30,000 Hz

FREQUENCY RESPONSE
10 — 50,000 Hz. — 3 db.
20 — 40,000 Hz. ± .25 db.

DISTORTION
Amp. only .04% at full power (1,000 Hz.)
Overall better than .15%
Intermod. better than .2%

SIGNAL / NOISE RATIO
58 db. on phono (better on other inputs)

SENSITIVITY
Phono 3 m.v.
other 200 m.v.

TONE CONTROL
Bass ±10 db. at 100 Hz.
Treble ±10 db. at 10,000 Hz.

DAMPING FACTORS
8 Ohms = 40. 15 Ohms = 70

POWER CONSUMPTION
45 watts.

Interstate Distributors:—

NSW: Electronic Parts Pty Ltd, 91a York St, Sydney.
SA: The Muses Pty Ltd (Sound Spectrum), 33 Regent Arcade, Adelaide.
Qld: Brisbane Agencies, 72 Wickham St, Valley, Brisbane.
WA: Arena Distributors (Australia) Pty Ltd, 196 Adelaide Tce, Perth.
Victoria, Tasmania & NT: J. H. Reproducers Co.

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293 HUNTINGDALE RD, CHADSTONE, VIC. 3148.
TELEPHONES: 277-3066, 277-3488

(Manufacturers of the famous "JH" Turntable)

This is the most suitable type for our purpose, being compact in size and still an economical proposition. However, it should be pointed out that if you wish to use a larger 9V battery and either make the metalwork larger to take it, or leave it external to the receiver, a longer life would be possible for only a little extra outlay. Just as a broad example, supposing that the type 2364 battery lasted for 60 hours of operation, a type 276P may be expected to last for about 130 hours. The cost of the larger battery is only marginally greater than the small one.

The above figures are only given as a guide and a very important point to watch with regard to battery life is the volume at which the set is used. The class B output stage draws current from the battery to a degree roughly proportional to the volume. Clearly, if the set is operated at a modest volume, the battery will last correspondingly longer. The choice is up to you.

The dial is quite a simple unit but adequate for the job. Many of the Australian broadcast stations are marked in groups for the six States, around the circular scale. A planetary drive is incorporated and the movement is very smooth, with a reduction of about 6:1. This makes tuning pleasant and easy. The complete dial assembly is marketed under the name of Jabel by Watkin Wynne Pty Ltd, and should be available from most radio components suppliers.

Construction of this little set has been made about as easy as it could be, as most of the components are contained on one printed board 7in x 3in. The only components external to the board are the louspeaker, battery and volume control. The latter has a 470pF capacitor mounted between the earthed and rotor lugs.

Mounting and soldering of the components on the board may best be done by following the coded picture which we have provided. Alternatively, some board manufacturers, such as RCS Radio Pty Ltd, actually print the code directly on the board. This makes assembly doubly easy.

Before proceeding with the assembly, it must again be emphasised that care should be taken not to overheat the components. This applies particularly to transistors and the point has been covered in more detail in Chapter 12.

A systematic approach to construction will make the job easier and here are some suggestions as to how it may be done.

Start with the smaller components and more specifically, all resistors may be mounted and soldered in. To make a neat job, the resistors should have their pigtails bent at right angles and at points equidistant from the body of the resistor. The pigtails are then dropped through the appropriate holes and with the body of the resistor against the surface of the board. Turn the board over and bend the two pigtails outwards by about 45 degrees. This stops the resistor from falling out during the soldering process. Cut the two leads off, leaving about 1/16in protruding and then carefully solder.

Having done all the resistors, the small capacitors are next. Treat them in a similar way to the resistors. It will be seen that some of the holes on the board are too close together to allow capacitors to be mounted against the board. There are six capacitors so affected and these are the two each across the IF transformers and the .0022uF and the .0012uF across the RF choke. These should be stood on end, with one end hard against the board and the other pigtail bent over and down so that it goes through the other hole.

Perhaps it should be noted that we have specified 630V rating types for many of the small value polystyrene capacitors. This has been done simply because in these capacitors, most suppliers stock only the 630V types. Needless to say lower voltage capacitors may certainly be used if your supplier has them.

The four electrolytic capacitors are next and should present no problems. However, care should be taken to make sure that they are mounted with due regard to polarity. If you should have any difficulty in getting "single ended" electrolytics, as we did with the 1000uF unit, then an ordinary one may be used and mounted in the same way as we have described for the other capacitors which were mounted on end. In some cases, it may be necessary to lengthen one pigtail by soldering another pigtail offcut to it.

The RF choke is mounted in a similar way to the resistors and with the coil resting against the board. The little ceramic filter must be given careful attention, as it is quite small and perhaps a little delicate. Make very sure that it it mounted with the dot on the case facing the 68pF capacitor. Press the filter hard against the board and the four corner tags may be bent over so that they lie against the copper to which each has to be soldered. Start with the unbent centre tag and carefully solder it, then follow with the other four. Be very careful not to allow any solder to run across and so bridge the gaps between the lugs and adjacent copper on the board.

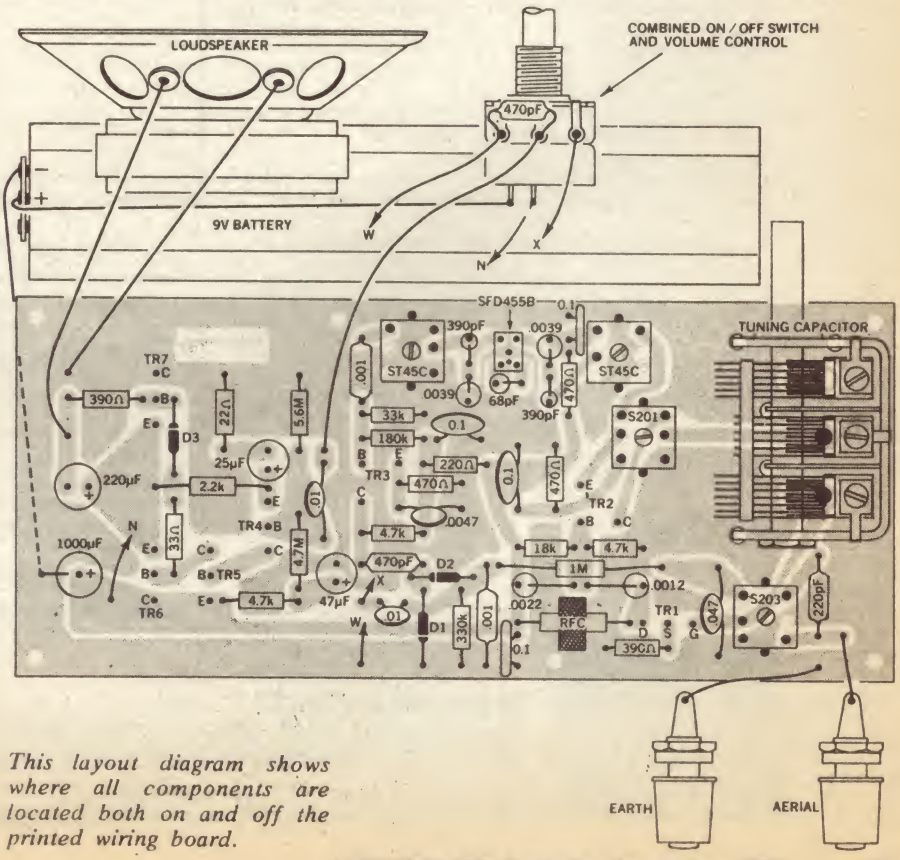
The four coils may be done next. Although it is not possible to put the coils into the board the wrong way around, care must be taken to see that each coil is placed in its correct position on the board. Push the lugs of the coil through the holes on the board and press the can hard against the board. Do not bend the lugs over, but first solder the two lugs of the can. Then solder all other lugs which connect to copper conductors. It will be noted that in some cases, lugs are left insolated and no attempt should be made to solder them.

There are still three OA91 diodes and these may be fitted now in the same way as the resistors were done. There are seven transistors and it may be seen that there are heat sinks on the two output transistors. Before soldering these in, it may be easier to fit the heat sinks. These are stretched over the metal case of the transistors. When fitting the transistors to the board, make sure that each one is in its right place and make sure also that the connections are correct. When the leads are pushed through the holes in the board, about 1/16in should protrude for soldering.

When the transistors are fitted, the driver transistor may be touching the heat sink of the TT801 or equivalent. This is simply remedied by bending the driver transistor slightly away from the other one.

The three gang capacitor is the largest and last component to be mounted. There are three mounting lugs, two rotor earthing lugs and three stator lugs to be soldered. Push them all through the appropriate holes and push the body of the gang hard against the board. Solder the three mounting lugs first.

It will be necessary to use much more solder than for other joints and to approach the lug from all directions, until it is soldered all around. The rotor lugs are treated in a similar manner, although they are not so heavy. Bend the stator lugs over

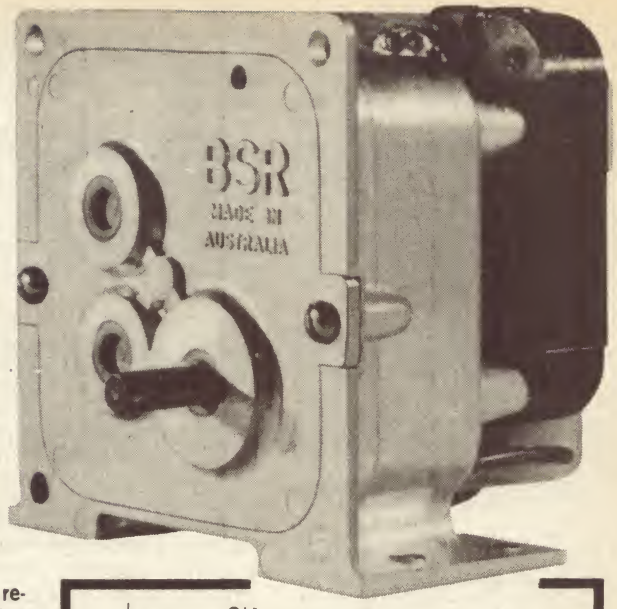


This layout diagram shows where all components are located both on and off the printed wiring board.

BSR

SUB-FRACTIONAL HORSEPOWER

Geared Motors



The VPS100 gear box is designed for applications requiring a compact, powerful drive unit and features a die-cast housing, sintered bronze bearings; machine-cut steel gears and pinions plus a non-metallic gear in the first reduction to keep noise to a minimum.

These units are designed to provide greater durability and are particularly suitable where continuous duty is required. All gears are grease lubricated.

They can be adapted to horizontal or vertical mounting and overall dimensions for the VPS100 motor and gear box are 3" x 3" x 3".

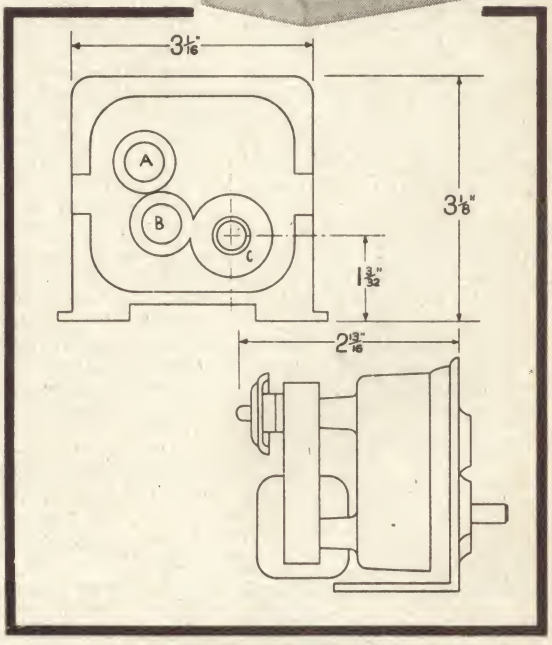
In the standard range, 38 alternative output speeds are available, from as low as 0.9 r.p.m. to 368 r.p.m. (Other speeds are also available but require special gears.)

The wide range of ratios available, together with the choice of 3 output shaft positions, A, B or C, gives great versatility in mounting and speed selection and make the VPS100 adaptable to many applications without expensive re-tooling.

For a unit of such compact dimensions, the torque output is considerable and, when powered by a ½' shaded pole motor, gives, e.g., 46 lb./in. at 0.9 r.p.m.

In those cases requiring still higher torque output and continuous operation a 1" shaded pole motor can be fitted. Alternatively, for intermittent use higher rated ½" or 1" motors are available if required.

In those applications where space is restricted an open gear box, type VPS101, can be provided, having the same general characteristics as type VPS100.



STANDARD BSR GEARED MOTOR VARIATIONS WITH ½" STACK SHADED POLE MOTOR.

VPS 100 A			VPS 100 B		
RPM No. Load	Starting Torque	Output Shaft Position Alt.	RPM No. Load	Starting Torque	Output Shaft Position Alt.
0.9	46 lb. in.	A or C	1	27 lb. in.	A or C
2.7	10.5 lb. in.	B	3	11.5 lb. in.	B
3.7		B	4.5		B
5		B	6		B
5.8	8.5 lb. in.	A or C	7	6.25 lb. in.	A or C
8	8.25 lb. in.	A or C	10	5.75 lb. in.	A or C
9.5		B	15.5	3.5 lb. in.	B
11		A or C	25		A or C
13	4.25 lb. in.	B	30	2.75 lb. in.	B
20		A or C	34.5	30 oz. in.	A or C
24	3.25 lb. in.	B	40		B
28	2.75 lb. in.	A or C	56.5		B
33		B	76	14.5 oz. in.	B
47		B	90	14 oz. in.	A or C
63	1.75 lb. in.	B	124		A or C
74	1 lb. in.	A or C	167		A or C
100		A or C	270	3.75 oz. in.	B
139		A or C	368	3.5 oz. in.	B
223	6.75 oz. in.	B			
304	4.75 oz. in.	B			

PRICE LIST VPS 100 MOTOR/GEARBOX

Quantity	½" Motor	1" Motor	1½" Motor
Single Unit	$10.73	$12.30	$14.79
2-15 Units	9.66	11.07	13.31
16-50 Units	9.12	10.46	12.57
51-100 Units	8.05	9.23	11.09
Over 100 Units	6.97	8.00	9.61

Prices for other than standard output speeds available on application.

Note: Quantity buys apply only to motors/gearboxes with the same specifications.

Prices apply in Australia only.

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NEW ZEALAND GPO BOX 2630 AUCKLAND **BSR:P92R**

so that they lie along the copper pad provided and then solder each one. In common with the other lugs, these also require a fair amount of solder.

To complete the board, nine leads of hook-up wire have to be soldered in. There are three for the volume control, two for the battery, two for the speaker and one each for the aerial and earth terminals. A variety of colours may be used to advantage and each lead should be long enough to reach the terminating point when the board is finally mounted on its chassis.

The completed printed board assembly, along with the other items, is mounted on a one-piece chassis-panel in the form of an "L" made from a piece of aluminium or other metal. The unit is 9in long, 4¼in high and 5in deep. Along the top of the front panel is a ½in fold, for added strength and to improve its appearance. Similarly, the base has a 1in fold up along the back, again for strength as well as to provide a mounting position for the aerial and earth terminals.

For readers who wish to make up their own metalwork, we have provided a drawing giving all the necessary details. One alternative is that ready made metalwork may be available commercially. Also, may we hasten to point out that it is not necessary to have a metal chassis and panel. Readers who feel so inclined may make up their own base and front panel from plywood, hardboard, etc.

Before attempting to mount any components on the panel and chassis, it would be wise to make a thorough check of the printed board assembly, to make sure that there are no errors or omissions. It is also a good idea to see that all joints have been properly soldered and that none has been missed.

Satisfied that all is well, we may now proceed with the final assembly. The two terminals on the back should be screwed in place, with the insulating washer provided for the aerial terminal, but without the insulating washer for the earth terminal. In each case, a solder lug is placed under the nut. When mounting the speaker on the front panel, a piece of grille cloth or perforated metal should be placed behind the panel to protect the cone of the speaker.

Before attempting to mount the dial assembly, undo the two screws and remove the circular cursor from the reduction drive and put the cursor aside for the moment. The dial movement is held in place with two countersunk head screws, each with a nut behind the panel. Another nut is run on to each screw and so placed that it provides a means of spacing the dial movement lugs from the back of the panel by the required amount. The correct spacing will be determined a little later on. With the dial movement in place, run another nut on to each screw and tighten lightly.

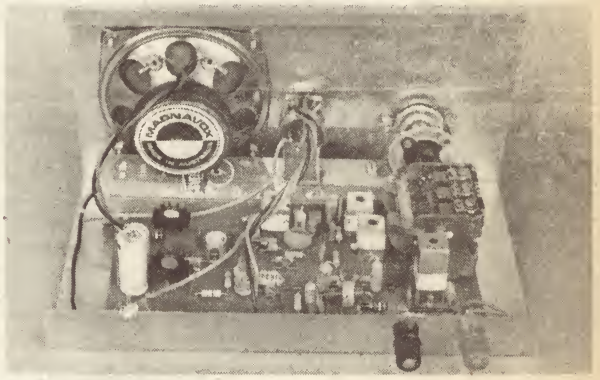
The dial scale is fixed to the front panel by the adhesive on the back, after the backing paper has been peeled off. Fixing the scale should be done with great care, so that it is central with the drive spindle and the line on the scale truly horizontal. When satisfied, the scale is gently rubbed in place. It is possible to lift it to change the position, by gently peeling it off and starting again.

The cursor may now be screwed back onto the drive assembly. The cursor must clear the dial scale by about 1/8in and this is adjusted by means of the spacing nuts on the screws which fix the lugs of the drive assembly to the front panel. When adjusted correctly, all nuts are finally tightened. The knob may also be fitted to the dial.

The printed board assembly is fixed to the base plate with six ½in spacers. It does not matter whether you fix the spacers to the base plate first, or the board. During the process, the dial drive is connected to the gang spindle, via a flexible coupling. It will be necessary to provide a piece of ¼in shaft, about 5/8in long. This may be obtained from the volume control shaft, which may be cut to the wanted length at this time.

The battery and volume control are the only items left. Slide the battery in just behind the front panel, from the speaker side and locating it laterally so that it does not foul the flexible coupling. When mounting the volume control, fix the crescent shaped clamp at the same time, so that it presses down on the battery and holds it in place.

All the wires from the board are now cut to length and terminated at the appropriate points. The two battery leads will be terminated in the battery plug and care must be taken to ensure that the correct polarity is observed. The positive lead will go via the switch on the back of the volume control.



This back view of our prototype shows how your receiver should look when completed. Note the 470pF capacitor on the volume control potentiometer.

Before attempting to align the receiver, it is important to have a good aerial and earth system. The earth wire should be run to a clamp on a water pipe, or to a metal plate buried in moist ground. For best results, the aerial wire should be as long and as high above ground level as possible. However, many readers in metropolitan areas may find that they will obtain adequate performance with just a few feet of wire.

As a preliminary to alignment, set the gang rotor plates fully in and see that the dial cursor is in line with the horizontal line on the dial scale. All grub screws in the drive between the dial and gang should be firmly tightened in this position.

With aerial and earth connected, switch on the receiver and advance the volume control. Then tune in the first station nearest the low frequency end of the dial. This will vary according to the location and will be 2FC in Sydney, 3AR in Melbourne, etc. With a proper aligning tool, proceed to adjust the slug in the second IF transformer for maximum response. Then similarly adjust the slug in the first IF transformer. Rock the dial about the station to make sure that the station is correctly tuned and proceed to touch up the previous adjustments.

The station already tuned in may not coincide with its marked position on the dial. If it does, then all is well. If not, then turn the dial pointer to the correct position and proceed to adjust the slug in the oscillator coil until the station reappears. Then adjust the slug in the aerial coil for maximum response. If by now, the station is so strong that it is difficult to determine the correct adjustments, remove the aerial and substitute a shorter one, at least for the time being.

Now tune in the local station which is nearest the high frequency end of the dial. Check its position on the dial scale and more than likely, it will not be in its correct place. Reset the pointer to the correct position and proceed to retune the station as before, using this time the trimmer on the oscillator section of the gang. The trimmer on the aerial coil section of the gang should then be adjusted for maximum response.

In common with all superhet receiver alignment, it is now necessary to go back to the station near the low frequency end of the dial, as it is almost certain that the pointer will no longer correspond exactly with the station. This must be corrected with the slug in the oscillator coil, after which the slug in the aerial coil is readjusted. Then return to the other station once again and go through a similar procedure, using the two trimmers. This procedure must be repeated for as many times as are necessary to bring the stations to their correct position on the dial scale, always remembering to use the coil slugs at the low end and the trimmers at the high end. With this, alignment is complete.

If you live in a metropolitan area and consider that you are in a fairly strong signal location, then you may wish to consider the use of a ferrite rod aerial coil (Aegis type S211) in place of the aerial coil shown in the circuit. Only the two end leads of the rod coil are used, being soldered to the points on the printed board corresponding to pins 1 and 2 of the aerial coil. The lead from the tap on the coil may be neatly taped to the body of the coil, out of the way.

If you intend to try both coils, then to avoid the problem of removing the aerial coil after it has been firmly soldered to the board it is a good idea to just push the coil pins through the board, so that there is even less than 1/32in for soldering. This will make unsoldering easy when you wish to remove this coil and try the rod coil.

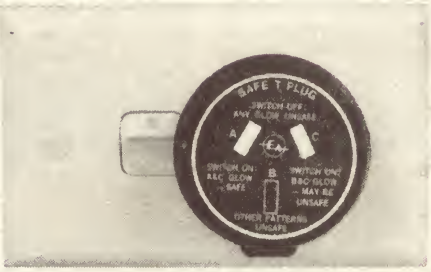
With your new receiver complete, you may expect many hours of enjoyment from it. It may be left as it is, or you may even make a cabinet of wood or other material for it. The cabinet may be so made that the receiver slides in from the front. Two cleats may be provided, one at each end of the cabinet so that a screw at each end of the panel will hold the whole assembly together.

This is a plug for safety...

Elementary Electronics

by ROSS TESTER

"A little knowledge is a dangerous thing." The writer of that proverb might well have been talking about electric power, for there are few things more dangerous than a person with a little knowledge tampering with the power supply. Whereas a person who is aware of his own ignorance will leave well enough alone, someone with a little knowledge — (but not enough) is likely to rush in — and become the angel who fears to tread!



We at Electronics Australia have been disturbed by recent electrocutions — Neville Williams had something to say about them in his Forum in the August issue.

We thought it time we presented an article about the power mains. Not to discourage our readers from using or building mains operated equipment — far from it. Rather to make them safety conscious — able to use the mains with confidence, knowing that what they are doing is correct.

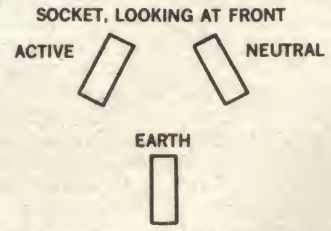
Working on the assumption that our young readers — particularly those who read Elementary Electronics — are the ones most likely to benefit by such an article, we have decided to forgo the usual elementary project this month, and present an article which, we hope, might prevent an accident.

Not that those who like a simple project each month have been neglected. Later in this article, we will show how to make a particularly useful safety device — a simple unit which can be plugged into any outlet and which will indicate immediately whether the outlet has been correctly wired. But more about this later.

Most of our readers would have seen marked on a power point (known as a GPO — general purpose outlet) the words "240V AC only 10A". If you have had the chance to see the reverse side of the outlet there would be, among other things, the letters A, N and E. What do these mean?

The "240V AC" means 240 volts, alternating current. This is the theoretical supply voltage to which household appliances and light machinery are connected. In fact, the voltage can vary, depending on the load placed on the supply network, but most supply authorities try to keep it within plus or minus 5%.

The "10A" means 10 amps, the amp being the unit of current flow. Ten amps is the usual maximum which can be drawn from one outlet. If more than this is drawn the outlet may overheat and eventually destroy itself. If you have ever felt an outlet after it has been supplying a 2400W (watts) room heater (which draws 10A) you will know what we mean.



This is the recommended SAA wiring for a 3 pin mains socket. It is reproduced normal size, as viewed from the front.

The letters A, N and E which we mentioned before stand for the words "active," "neutral" and "earth." These names are given to the three wires in the system.

Two of the wires, the active and the neutral, connect to the wires coming into the house from the street mains. The third wire, the earth wire, is connected to a good earth connection — typically a water pipe — within the boundaries of the property.

Of the two wires which go back to the substation, one is earthed at the substation. This is the neutral wire. Logically, the other wire is called the active.

In terms of safety, it is the active wire which is dangerous. It is at 240 volts with respect to the neutral and, because the neutral is earthed, with respect to any earthed object. If a person completes a circuit between an active line and the neutral or an earthed object, they will receive a shock. Just how severe the shock will be depends on how good a connection they make to the earthed object. It may simply tickle, or it may kill.

Conversely, a person completely insulated from earth could handle the active line (only) with perfect safety. Witness the birds that perch on high voltage lines without even being aware that these lines are "live".

The earth, active and neutral lines connect to the three pins in the outlet.
There should never be an outlet which is not controlled by a switch. The switch must, by regulations, be in the active line.

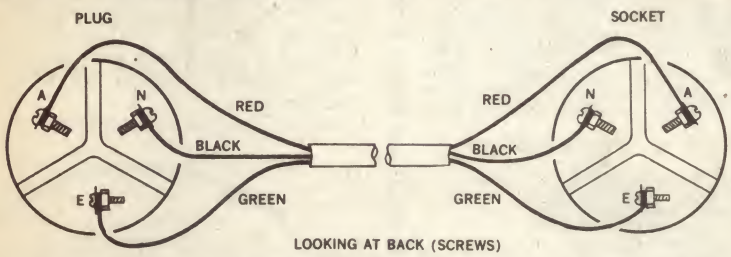
Unfortunately, there is no strict rule as to which of the two supply pins — as distinct from the earth pin — should be used for active and neutral respectively. However, there is a recommendation that the left hand pin, when facing the socket, should be the active and most modern installations would satisfy this requirement. But there are many older installations, or amateur ones, which do not. While not necessarily dangerous in themselves, they can help create a dangerous situation in conjunction with incorrectly wired appliances or extension leads.

In any plug or flexible cord there should be three wires, each insulated from the other by a coloured PVC sleeve. In Australia, the colours used in the past have been red, black, and green. Other countries have used other combinations. A new colour code is now emerging, recommended by the IEC (International Electrotechnical Commission) and is being accepted by most countries, including Australia. Hopefully it will become a world standard. The new colours are brown, blue, and a green / yellow stripe pattern.

The red lead (or brown in the IEC code) should be used for the active lead, black (or blue) for the neutral, and green (or green / yellow) for the earth.

However, this code is not always followed correctly. Never, in any circumstances, assume that a lead which is black or comes from the right hand pin is the neutral line. In many cases, particularly on older outlets, it isn't!

We have shown the three pin outlet and the connections which are now regarded as standard.



How to wire an extension cable. Check it by pushing the plug into the socket and noting that the lead colours correspond for all three pins.

The other end of the flexible cord must be correctly connected to the appliance. The active and neutral wires connect to the heating element, motor terminals, transformer etc and, in general, it does not matter which way round these two are connected. However, if there is a switch on the appliance, it should be in the active line.

The earth wire, green or green / yellow, connects to the metal frame of the appliance. It is vitally important that this lead is not confused with either of the other leads. Transposed active and earth leads will result in the active lead being connected to the appliance frame; a very dangerous situation tempered only by the fact that the appliance will not work thus, hopefully, leading to an investigation before anyone is hurt.

A transposed earth and neutral can be just as dangerous, but is more subtle. The appliance will work in a correctly wired power point, and is not particularly dangerous. But in a power point with transposed active and neutral pins it will not work and, again, the active is connected to the appliance frame.

Correctly connected, the earth wire provides a very high order of protection. Without it, an insulation breakdown within the appliance can result in the frame being connected to the active line. If the frame is then handled by someone in an earthed situation he will receive a shock; a shock which could be fatal.

By an earthed situation we mean standing on a concrete floor in leather shoes (usually slightly damp) or worse still, out of doors on bare earth. It can also mean touching an earthed object, such as a tap, water pipe etc.

With an earth wire properly connected, a breakdown to frame will result in a short circuit across that particular supply circuit, causing a blown fuse or tripped circuit breaker, thus disconnecting the supply and drawing attention to the fault.

If you have to replace a fuse (and the chances are that you will sooner or later), make sure that you first turn off the power at the main switch. This switch is always labelled as such. Just because the circuit is dead does not mean that power is disconnected. In fact, one of the fuse contacts will still have 240V applied to it.

The fuse box should have labels on it to tell you which fuse controls which circuit, so there should be only a couple to choose from. Remove suspected fuses one by one, and replace before removing the next one. Different circuits may require different fuses, so do not mix them up.

When the blown fuse is located (you will be able to tell it by the burn marks on the procelain) note which fuse wire is used in it from its label. Replace with a single strand of the same wire. (This is available quite cheaply from hardware and department stores.) Never (except, perhaps, in cases of extreme and genuine emergency) replace the fuse wire with another gauge or ordinary wire — it is too easy to forget.

A fuse may blow for two reasons: the circuit has been overloaded with too many appliances, or one of the appliances is faulty. In the former case the load should be lightened before the power is turned back on. If a faulty appliance or wiring is suspected, the supply authority should be contacted.

In the case of a tripped contact breaker there is no need to turn off the power, but the cause of the failure must still be investigated.

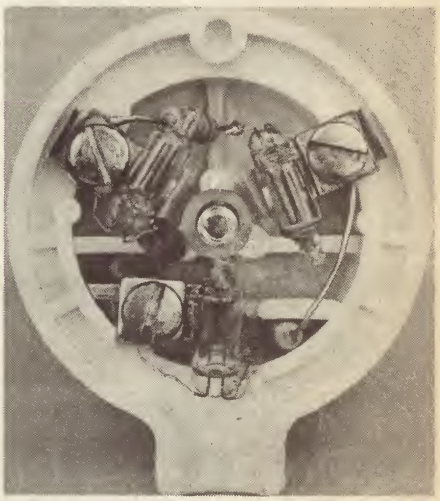
A common cause of the twenty or so electrocutions which occur each year is incorrectly wired plugs and sockets on extension leads, together with a "mirror image" type double adaptor which has now been withdrawn from sale.

These adaptors cause an active / neutral transposition on one outlet. While not usually dangerous in itself, this can contribute to a dangerous situation if used with an appliance or extension lead having an equally innocent looking fault — a neutral earth transposition. Together they make a death trap. If you have one of these adaptors, destroy it.

Similarly, if you have an extension cord, check it very carefully to make sure it is wired correctly.

If you must wire a mains cord or extension lead yourself (they are best left to electricians) take care. We have shown how they should be wired, but there is still the chance that a mistake can be made. With this in mind, we present our SAFE-T-PLUG.

We must admit that the idea is not our own. Apparently, such devices have been available overseas, although we have never seen one. One of our readers, Rev R. W. Fiegert, of Finschafen, New Guinea,



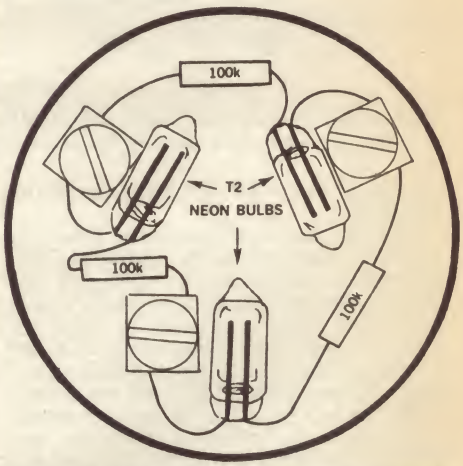
Wiring and assembly of the SAFE-T-PLUG. Compare it with the diagram on page 80.

mentioned the idea to us some time ago, and we elaborated on it until we had a design we liked.

We took an ordinary three pin "piggy back" plug, removed some of the interior wire guides which normally keep the three wires separate, and placed between each pin a neon globe and a series resistor. The diagrams and photos may give a better idea of this. We then made an instruction label to fit over the back of the plug.

These instructions list four different situations. We investigated all of the possible wiring combinations in our laboratory and found that there are only four patterns which require to be recognised.

The first condition is with the switch off. If



How the plug is wired. Follow this carefully to ensure correct operations.

any lights glow the outlet is wrongly wired. The switch should be in the active line, but presence of a glow means that this requirement has not been satisfied. The situation should be treated as dangerous.

The remaining conditions are with the switch on. If lamps A & C glow, the outlet may be be regarded as a safe one into which an appliance may be plugged

If lamps A & B glow, the outlet or lead has an active / neutral transposition. As we said before, this in itself is not normally dangerous, but another fault may make it so.

It should be treated as potentially dangerous.

If any other patterns appear the outlet must be regarded as unsafe. If all three lamps glow, either the neutral or earth lead is open circuit. An open neutral lead is not likely, because no correctly wired appliances would work from the outlet if it was. However, the possiblity that the earth is open circuit is very much greater. It would not be noticed until such times as a fault occured, and then there would be no earth wire to protect the user. It is most important to have the earth wire intact.

While investigating this unit we were made aware of two shortcomings which appear to be inevitable with such a simple device. Provided these are appreciated, their importance will be minimised.

The first concerns the unit's inability to detect transposed earth and neutral wires. Thus, the condition "A & C glow" could be obtained with a neutral / earth transposition. As we stated earlier, this situation,

Elementary Electronics Ideas Worth Trying

Spacer Substitute

Projects published in "Electronics Australia" often call for "1in x ¼in insulated pillars, tapped ⅛ Whit." While these are ideal for the purpose, they are relatively expensive, about 20c, considering the material involved.

After looking for a substitute I found that plastic "Rawlplugs", as used in the building industry, are very suitable. They are rigid, strong, and come in a variety of lengths and diameters. The minimum length appears to be 1in, but they maybe cut with a sharp knife or razor blade. The diameters are designated by colour and the smallest (red) appears to be the most suitable.

Small self tapping screws are used to hold the insulator to the circuit board or panel, etc. Use around number 4 screws — anything larger may split the Rawlplug.

Perhaps the best feature of these is the price. They retail for a little over 1 cent each, against the twenty or more for the conventional units, and are available at most hardware stores. (T.R. Enfield NSW)

Cheap Connector

How many times have you needed a connector for a nine volt battery — and not had one. In many cases, I, for one, have had to resort to wrapping wire around the terminals — not the best at any time.

Instead of discarding a dead battery, cut the top off with a hacksaw. Cut about ⅛in down from the top, taking care not to spill the contents of the battery. The terminal plate of the battery will come out intact — and this is a perfect connector for another nine volt battery. The contacts take solder quite well. The larger (star shaped) terminal becomes the positive, so solder a red wire to it, and a black to the smaller terminal.

The result — a very cheap battery connector! (From T. R., Enfield, NSW.)

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while undesirable, does not constitute a serious hazard in itself.

Thus, there should be little hazard in plugging an appliance into a socket which gives such an indication. However, it is most important that the socket tested should be the last one in any chain of extension leads or double adaptors — in short, the socket into which the actual appliance will be plugged.

The second concerns the earth connection. The tester should indicate an open circuit earth wire (B glows) and such an indication is quite unambiguous. However, due to the high sensitivity of the lamps, it cannot distinguish between a good earth connection and one which may have developed significant resistance. Such a situation is most likely to occur at the actual earth connection in the installation proper, rather than in extension leads, adaptors, or other auxiliary devices.

To construct the SAFE-T-PLUG, you will need the following parts: 1 piggy back 240V plug, 3 miniature neon bulbs (T2), 3 100k resistors (1/2W), 1 SAFE-T-PLUG LABEL.

The label is an important part of the unit. Some of our advertisers may decide to make these available in thin metal but, in the meantime, we will make photographic copies available, black or white, for $0.50.

Start by removing the back of the plug. Then, with a pair of side-cutters, remove most of the wire guides in the back. Take very small "bites" otherwise the plastic may crack through. Remove only enough of the guides and separators to enable the neons to fit beneath the slots. The resistors fit deep inside the plug.

Then place a neon on each of the clasps which would normally accept the second plug points. Using our diagrams as a guide, screw one of the neon leads under the screws. Place the three resistors where they do not foul any plastic or metal and, after cutting the leads to suit, solder them to the neons. Screw the other end under the opposite screws.

It is important to place the neons where we have shown them on the diagram, with their resistors going to the correct pins. Otherwise, the patterns which appear will not be the same as ours. Equally important, the leads from the neons or the resistors must not foul any of the other wiring or pins. If there is any danger of a short occurring, use insulation tape or spaghetti. Remember that when the back is replaced the pressure might move the neons slightly.

Note that the tip of the neon on the earth pin must clear the centre shaft of the back when it is placed in position, otherwise the neon may be broken or cracked. The neons should not be stressed too much, neither should their leads.

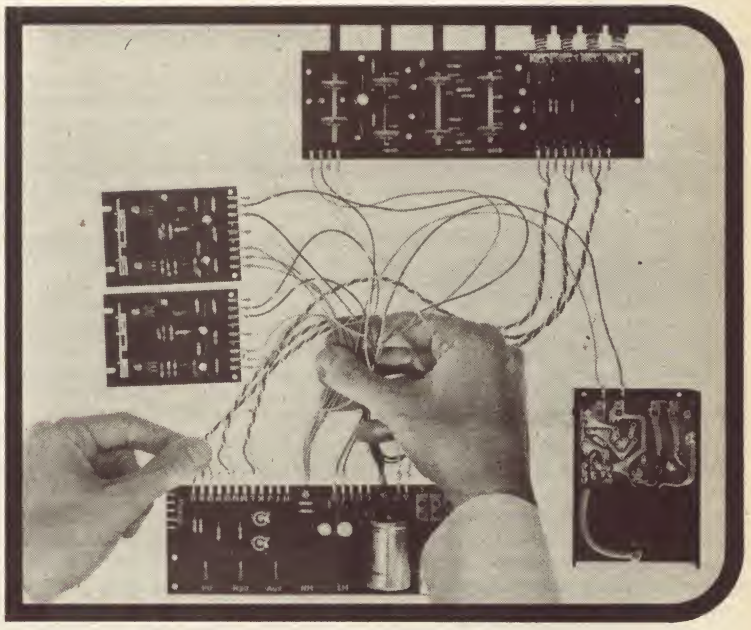
When the internal components are assembled, screw the back on slowly, making sure that none of the neons is stressed. Before plugging in, check with a multimeter set on a high ohms range. There should be no reading between any two pins. If there is, something is wrong. If all is well, plug into an outlet, and turn on. The two top lights should glow (unless you have an incorrect outlet).

The only way to check the bottom neon (B) is to plug it into an outlet with no earth connection. One way is to use an extension lead and, temporarily, remove the earth wire. If all is well, all three neons should glow. Do not forget to re-connect the earth lead.

Once satisfied that the indicator is working properly, the label can be fitted. Cut out the slots for the neons before sticking on, using a razor blade or sharp modeller's knife. Cut around the outside edge of the circle with a pair of scissors.

We finished off the plug with a liberal spray of clear enamel, to protect the label surface. Take care not to spray the pins, which would leave an insulating layer on them. Allow the plug to dry, and you have a piece of test equipment, which will come in handy many times.

The do it yourself amplifier for non-technical people who hate soldering irons.



(The Sinclair Project 605)

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CLASSICAL RECORDINGS

Reviewed by Julian Russell

Tannhauser—first complete Paris version

WAGNER — Tannhauser. Paris Version. Hans Sotin (Landgrave); Helga Dernesch (Elisabeth); Rene Kollo (Tannhauser); Victor Braun (Wolfram), Werner Hollweg (Walter); Christa Ludwig (Venus) and others with the Vienna State Opera Chorus, the Vienna Boys' Choir and the Vienna Philharmonic Orchestra conducted by Georg Solti. Decca Stereo SET 506/9.

Since to my knowledge this is the first really complete Paris Version of Tannhauser ever to be issued I had better explain to readers how and why it differs from the Dresden version, of which there is no shortage of recordings. In its original form Tannhauser was first performed in Dresden in 1845 but in 1849, Wagner had to leave that city as fast as he could because he had been active in an anti-governmental revolt which had failed. Exile was Wagner's lot and after wandering about Europe living as best he could, mostly by sponging on his friends and admirers, he found himself in Paris in 1859. At this time, despite his wanderings, he had The Rhinegold, The Valkyrie, most of Siegfried and Tristan behind him and his style had matured accordingly.

1859 was the year that the director of the Paris opera decided to mount Tannhauser after a stronger than usual hint from the Emperor Napoleon 3rd. It must be remembered that Wagner had many powerful friend in Paris among whom were Gounod, Rossini and Saint-Saens to name the musicians, the poet Baudelaire, and the influential wife of the Austrian ambassador, the Princess Metternich. Now although at this time Wagner had already written Tristan and Isolda, one of the greatest works ever to be created by the human mind, for financial reasons he jumped at the opportunity of staging Tannhauser. Moreover everything seemed set for a tremendous success. But two clouds appeared on the rosy horizon. The libretto had to be translated into French, an immutable rule for all foreign operas in Paris and one to which the composer reluctantly assented.

But it was the second condition that infuriated Wagner to a state closely bordering on frenzy. He was told that a ballet had to be written and included in the second act, where it would completely ruin the continuity of the music and drama. Its inclusion, largely to satisfy the young bucks of the Jockey Club — rich young men more often than not the lovers of the ballet girls — was to Wagner unthinkable. After much quarrelling he finally agreed to extend the Venusberg Music at the beginning of the first act to dimensions that might permit it to be called a ballet. It must not be forgotten that while Tannhauser was a comparatively early work this new music was to be written at the peak of Wagner's mature power. But even this did not satisfy the quite unreasonable demands of the Jockey Club members, who hated the idea of having to rush their dinners in order to see their girl friends right at the beginning of the opera. They threatened to demonstrate during the performance.

But Wagner stuck to his Venusberg Ballet, and the opposition stuck to their intention to show their displeasure. Wagner wrote his inspired music and despite no fewer than 63 rehearsals of this and the other parts of the opera the performance was a calamity. The Jockey Club louts kept their word and despite the presence in the opera house of the Emperor and Empress blew whistles and catcalled throughout the show and even engaged in fisticuffs with those who approved it. Exactly the same reception that Stravinsky's Rite of Spring received in the same hall some 50 years later. The outcome was ruinous for Wagner, and Tannhauser was not performed in Paris again for 34 years.

The version you will hear on this Decca set is the Paris version with the ballet as Wagner rewrote it and the many revisions he made at the same time to the first scene with Tannhauser and Venus. I shall never forget the shock I got when as a boy, just after World War one, I first heard the Paris version given in the opera by Beecham in London. Not knowing at the time of the Paris revision I had been waiting for the end of the concert hall version of the overture which, you may recall, ends with a formal repetition of the Pilgrims' Chorus theme. Instead to my astonished eyes and ears the curtain rose on the climax of the original repeat of the Venusberg music and the orchestra launched into the erotic, overwhelming turmoil of the Paris revision. You'll be able to spot for yourselves the splice after the repeat to Tannhauser's song in praise of Venus and the return for a few bars of the old Venusberg music. The new music is ushered in by high thirds on the trumpets in the new Tristan-skilled manner.

In one magical bar the orchestra becomes incandescent and seethes with a disciplined turmoil that plunges you into what would be called today a psychedelic experience. There are some musicians who deplore the introduction of this new music on the grounds that it is out of style with the rest of the work and results in a patchwork score. They have a point but personally I would hate to miss the very same thrill that I had listening to it over a half a century ago. So far as I am concerned the rest of the work can take good care of itself with its offer of the brilliant fanfares and the end of Act one, Elizabeth's Greeting to the Hall of Song, the fine March, the Prelude to Act 3 and Tannhauser's third act narration which points unmistakably to the great Wagner of his maturity. There is, too, the ever popular "O, Star of Eve" sung by the wholly sympathetic Wolfram and still in the repertoire of many baritones and Winter Garden trios.

True, there is much of it that I listen to dutifully rather than with any great sense of delight although even in this early work one can still detect here and there the work of the master hand limbering up for the formidable creative tasks that awaited Wagner after he had finished that deadly bore of a work, Lohengrin.

Solti wins a fine performance from his team. The Venusberg Bacchanale seethes erotically just as it should, indeed throughout the entire work the Vienna Philharmonic Orchestra is at the very top of its superb form. The choir, too, whether approaching and receding as pilgrims, or as nobles in the Hall of Song, are never less than faultless. Christa Ludwig has just the right kind of seductive voice to sing to perfection the rewritten role of Venus. Helga Dernesch is highly competent if never very exciting as Elizabeth but Victor Braun is both stylish and mellifluous as Wolfram.

Hans Sotin, as a dignified Landgrave, is worthy of more interesting music than is his lot in the opera. He can even carry one over the longueurs of his address in Act 2. Rene Kollo is a bright toned, eager Tannhauser, delicately poised this side of brashness but offering much evidence of a bright future. It was a splendid idea to get the Vienna Boys' Choir to sing the parts of the younger pilgrims instead of women, as is generally the case. And the youngster who sings the Shepherd Boy's solo deserved more than the anonymity allotted to him in the excellent brochure that accompanies the boxed set of four discs.

★ ★ ★

ELGAR — Piano Quintet. Concert Allegro. Sonatina; Adieu; Serenade. John Ogdon (piano) and the Allegri Quartet. EMI Stereo ASD2501.

The Concert Allegro is a virtuoso piece, and very much of a period piece too. It offers rhapsodic, episodic music that, without pianist Ogdon's concentration, might have sounded very scrappy indeed. Ogdon gives it cohesion by a series of very subtle tempo and dynamic changes. But even under Ogdon's magic fingers it all sounds very difficult indeed, presenting the sort of difficulties that crop up when a composer is not comfortable writing for an instrument. Despite my love for Elgar I found this piece a bit of a bore, even with Ogdon's dazzling contribution.

The Sonatina is in two short movements marked a and b. The first an Andantino, is strongly reminiscent of Schumann in one of his "miniature" moods. The second is marked allegro but Ogdon takes it very close to presto. Apart from that I can't think of anything more to add.

After these unimpressive examples of Elgar's work, the Quintet is vintage stuff. It is logical in form, marked by the characteristic Elgarian rising 6th. Here you will find no patchwork. The Quintet was composed as late as 1918/19 and the composer uses a dialectic that was soon to fall into disuse. The thematic material is attractive with here and there an astonishing modulation. The balance between the piano

and strings is faultless. In the Adagio a first subject in a deeply felt elegiacal mood is followed by what I can only describe as an unworthy second subject. Yet despite this handicap it remains one of Elgar's most eloquent slow movements. The finale is ushered in by an Andante with the following Allegro unmistakeably Elgar. This is music likely to be enjoyed by the older rather than the younger members of the community.

The Adieu would in ordinary circumstances by described as tea garden music. But Ogdon's wonderful playing of it takes it right out of this class. The Serenade, another piano solo, is more sentimental than the Adieu. Its dimensions are unarguably small, but as played by Ogdon it is by no means trivial.

★ ★ ★

MOZART — The Late Symphonies.
No 35 in D K385. (Haffner).
No 36 in C, K425 (Linz).
No 38 in D, K504 (Prague).
No 39 in E Flat, K543.
No 40 in G Minor, K550.
No 41 in C, K551 (Jupiter).
Berlin Philharmonic Orchestra conducted by Karl Bohm. DGG Stereo 2721 040.

I am sorry that I am unable to treat these immaculate performances in more detail. Generally speaking they are beyond praise. Of course, I do not expect everyone to agree either with me or with everything that Bohm does. There are bound to be some readers who have their own favourite disc of one of the six symphonies played here and I myself find myself in disagreement occasionally with Bohm on the question of slow tempos. Each symphony has its own strong identity yet you are never in doubt that you are listening to Mozart enchantingly played and faultlessly recorded. I found them all so fresh and fragrant that I played the whole six at one sitting though I don't recommend making a habit of this. If you are in doubt what to give a musical friend for a Xmas present this should solve your problem. The three discs are issued in an attractive box without annotations. But then only the veriest tyro would be likely to need notes on these last six symphonies.

★ ★ ★

MOZART — Symphonies Nos 46 in C major; 26 in E Flat Major; 30 in D major; and the Masonic Funeral Music. Mozarteum Orchestra of Salzburg conducted by Mladen Basic. Eurodisc Stereo SEDC 80007.

The sleeve calls these seldom played works the Salzburg Symphonies though Harry Tyrer's translation of the original German notes points out that the C Major (K96) was composed in Milan. It has a brief lively first movement and an Andante that plods a little in its progress through a lovely cantilena, a menuetto so heavy handed that it sounds like a landler — even the trio sticks to a metronomic beat — and a not very impressive Allegro molto Finale.

Symphony No 26, in E Flat is typically early Mozart in three movements, a fashionable form before the true symphonic form as we know it a few years later had been consolidated. The Andante movement in C Minor is rich in the loveliest things but the whole work is played too deadpan for my liking. Even an occasional inflection would have been welcome.

Although there is little that Mozart wrote,

however trivial, that is not worth the time spent listening to it, No 30 in D Major is one of his less considerable symphonies with nothing I could detect in the performance to lend it more than passing interest.

Things are different in the Masonic Funeral Music. This is solemnly but expressively played. Though brief, its effect is majestic. And like all good funeral music it dignifies death and leaves the mourning to the survivors.

★ ★ ★

LISZT — Symphonic Poems: Ce qu'on entend sur la Montagne-Hunnenschlacht — Von der Wiege bis zum Grabe. Philips Stereo 6500 189.

Here are some excellent performances of neglected romantic symphonic poems that had a considerable influence on the course of Romantic music during the 19th century. I think it would be safe to bet that you would never find them on a concert program nowadays, so that their presence in this form is all the more welcome.

The first, "Ce qu'on entend sur la montagne" is, or perhaps was is a better word, better known as the Berg Symphonie. Here no hint is given of its program except that it is based on a poem by Victor Hugo. There is about it a sort of wild romanticism and the London Philharmonic under Haitink play it superbly. But without a program one becomes only too aware of its length. It takes up a whole side. Some of the music is languorous, some very spirited indeed. But a whole side is a bit too much for even this Liszt enthusiast.

Hunnenschlacht (Battle of the Huns) is described as from a mural by Wilhelm von Kaubach. Ghostly Huns and Christians fight to an outcome that leaves you in no doubt as to the victor when at the end a beautifully recorded organ supplies the clue. But before that, a dotted note rhythm gallops along with much dash and some brass flourishes in the form of bugle calls. (The sleeve notes are in untranslated German so you wont get much information from those.)

The third work, From Cradle to Grave, is Liszt's last of many symphonic poems and is in three short movements. The very lovely first movement, lightly scored for harp, flutes and upper strings, is played with moving tranquility. This is obviously the cradle. In the second movement you have the conflicts of maturity in which some quite wonderful flourishes on horns must have sounded very modern indeed back in 1881.

The movement is full of well directed energy and gives way to the quiet of the grave — and I rather think resurrection, too. Although such works are dismissed nowadays by most musicians with a lofty sniff I think they are well worth preserving. And Haitink and the LPO were an excellent choice for the job.

★ ★ ★

TWO PIANO ENCORES — Short items by Brahms, Schubert, Schumann, Arensky, Rachmaninov, Khatchaturian, Weinberger and Poulenc. Bracha Eden and Alexander Tamir (pianos). Decca Stereo SXLA 6484.

Although the items in this recital vary greatly in their content and presentation, most listeners should find something to enjoy. The Rachmaninov Barcarolle is tuneful but disappointing. It is an early work — Op. 5 — and technically innocent. For instance, the accompaniment consists for the most part of spread chords and a fussy little counter-tune on the second piano grows to sound much too busy.

Khatchaturian's Fantastic Waltz fails to live up to its title and will surprise no one who knows his style. Weinberger's Polka and Fugue from Schwanda the Bagpiper might sound a little faded in its orchestral form but it sounds quite brilliant on the two pianos. The fugue is stated with beautiful clarity in its many strands, but behind it all is the hint of a metronome. However, that apart, there is always the ingenuity of the polyphony to be admired and above all the immensely effective return of the Polka Tune at the end of the fugue.

Poulenc's The Embarkment for Cythera, a well-known Watteau painting, gives us Poulenc the boulevardier scattering an entrancing little collection of the sweetest imaginable tunes, hopping from key to key quite without any sense of responsibility but always full of surprises.

The Schubert Rondeau, Op. 139 is ambiguously sub-titled "Notre amitie est invariable" and has an almost Lisztian opening but soon reverts to pure Schubert, music almost any experienced listener could not fail to identify as the composer's. Here the playing is always full of entrancing nuancing. Then you have five of the Brahms Waltzes, Op. 39, Nos. 9, 10, 11, 15, and 16, an attractive selection very well played indeed. No 15 will be familiar to everybody in different transcriptions. The most interesting is No 16 with melody and counter melody passing from one player to the other.

Then comes what is to me the most enjoyable little piece on the disc, Arensky's Waltz from the Suite for Two Pianos, Op 15, No 2. Despite a tendency to dead-pan playing, this delicious little tune will, if you are like me, haunt your mind for days.

Schumann is represented by Six Studies in Canon Form arranged for two pianos by Debussy. All six are so musical that the strict canon form passes almost unnoticed. These, too, are admirably played.

★ ★ ★

MAHLER — Symphony No 1 in D Major. London Symphony Orchestra conducted by Jascha Horenstein. World Record Club Stereo S / 5037.

Some time ago I enthusiastically reviewed Kubelik's recording of this symphony for DGG. I cannot imagine a more different interpretation than Horenstein's yet it has incontrovertible validity. The differences are many and subtle, too many to be mentioned separately here. But the Horenstein is without doubt good enough to represent a fine bargain at its club price compared to the full priced Kubelik. A side by side comparison might have illustrated more emphatically my enjoyment of both discs. As it is I can recommend both with the greatest confidence. And the difference in the readings would make the acquisition of both of continuing interest if the question of finance is not a factor.

The dynamic range is abnormally wide, in the Horenstein, and you'll need to give your volume control a great deal of gain to bring in the most pianissimo passages but this will make the louder sections uncomfortably noisy.

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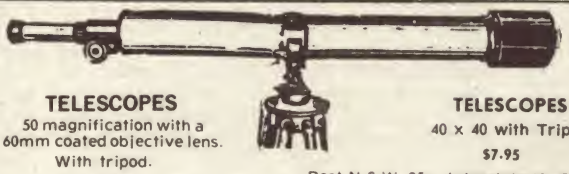

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Devotional Records

THE BEST OF THE WHITE SISTERS. Stereo, Word WST-8554-LP. From Sacred Productions Aust, 181 Clarence St, Sydney and other capitals.

It is many years now since I wrote an enthusiastic review of the White Sisters' first album. That same album provided the pattern for quite a few local trios seeking to copy their close harmony and their bright arrangements. Since then, a further seven albums are a measure of their wide acceptance. This one, number nine, is an excellent sampler of what has gone before:

Brighten The Corner — Must Jesus Bear The Cross Alone — That's What He Did For Me — My Saviour First Of All — Count Your Blessings — Who Knows — Old Time Religion — He Died Of A Broken Heart — O Love That Will Not Let Me Go — He'll Never Let You Fall — If We Could See Beyond Today — There's No Disappointment In Jesus.

A Gospel album that will appeal to all age groups. Recommended. W.N.W.

★ ★ ★

THE LORD'S PRAYER and Other Songs of Faith. Pat Boone. Stereo, Calendar (Festival) SR66-9825.

This is a budget-priced re-issue of an album which, if memory serves me correctly, first appeared six or seven years ago. The notes refer to a whole series of entertainment and personality awards made around 1960 and that is probably a clue.

Many, however, may prefer Pat Boone's enthusiastic and uncomplicated approach in that period. He was certainly in good voice and the quality of the recording is above reproach.

A generous program includes: Ave Maria — I Believe — He — Onward Christian Soldiers — True-Hearted Whole-Hearted — The Lord's Prayer — In The Garden — Softly And Tenderly — Will The Circle Be Unbroken — Yield Not To Temptation — Have Thine Own Way, Lord — Now The Day Is Over.

Excellent value if you like straight Gospel songs, well sung. (W.N.W.)

★ ★ ★

GODSPELL. Music and Lyrics by Stephen Schwartz. Stereo, Horizon (Festival) SH66-94086.

The jacket of this album is devoid of information other than it was performed by the original English recording cast. In the unlikely event that you haven't caught up with Godspell, it is a stage musical based broadly on the Gospel of St Matthew. The music is predominantly soft rock, but with elements of revival themes, vaudeville, soft-shoe and Afro-Asian.

My review of an earlier album was unenthusiastic on a personal, devotional plane but the recording was smartly purloined and obviously prized by a niece! Generation gap?

The track titles: Prepare Ye The Way — Save The People — Day By Day — Learn Your Lessons Well — Bless The Lord — All Good Gifts — Light Of The World — Turn Back O Man — By My Side — We Beseech Thee — On The Willows — Long Live God — Day By Day.

I criticised the earlier recording for poor diction but this one presents no such problem. The recording quality is good, so is the price — $2.59. Buy with confidence if Godspell is in your orbit! (W.N.W.).

★ ★ ★

SONGS THAT TOUCH THE HEART. Volume 2. Lorin Whitney playing the Robert Morton pipe organ. Stereo, Sacred LPS-74057. From Sacred Productions Aust, 181 Clarence St, Sydney and other capitals.

The 4-manual Robert Morton cinema style organ used for this recording is installed in the Whitney Recording Studios in Glendale, California. The combination of a very large instrument, heavy registration and "songs that touch the heart" adds up to rather massive sentiment, if played at the level beloved by organ enthusiasts. I imagine that the album will find its most useful role played at modest level, as mood music. In fact, I played it through a second time in that fashion and liked it much better.

The tracks: Sweeter As The Years Go By — Thou Wilt Keep Him In Perfect Peace — Lead Me To Calvary — I Cannot Fail The Lord — The Lord's My Shepherd — He Hideth My Soul — Close To Thee — The Comforter Has Come — O Touch The Hem Of His Garment — Fill Me Now.

Good for devotional background music. (W.N.W.)

★ ★ ★

MOZART — DEVOTIONAL WORKS. Soloists and the London Symphony Orchestra and Chorus conducted by Colin Davis. Stereo, Philips 6500 271.

Despite the title, it is only the texts of three of these works which can be called devotional. Like most of Mozart's music for church performance, the music is secular and operatic in style. This is particularly true of the motet "Exultate, Jubilate", originally commissioned by the Venetian castrato Venanzio Rauzzini, a famous opera singer of his time, and designed to show off his magnificent voice. The part is sung here by soprano Kiri Te Kanawa, who has a pleasingly clear voice, well controlled and accurately on pitch, with a minimum of vibrato, but rather lacking in power. The same singer is joined by contralto Elizabeth Bainbridge in the major work here, "Vesperae solennes de confessore", and ably supported by the choir and orchestra, they present a thoroughly professional performance.

The two other works are the "Kyrie in D minor" and the motet "Ave verum corpus", both little gems. The sombre beauty of the "Kyrie" requires a full scale four-part choir and orchestra for its realisation. On the other hand, the motet "Ave verum corpus" is quite unlike most of Mozart's church music, and is essentially simple and devotional in character. This is explained by its origins. Mozart composed it for his friend Stoll, a village schoolmaster, and it was first performed in the modest church of the village of Baden, near Vienna. It is scored for chorus, strings and organ. The performances here are entirely satisfying, as is the recording by Philips. (H.A.T.)

★ ★ ★

THE MAGNIFICENT SANCTUARY BAND. Roy Clark. Stereo, DOT (Festival) SZL-934,456.

Well known on US network TV, Roy Clark is variously described in the jacket notes as a "superstar of C&W" and "a nut". Here he exposes another facet of his extensive repertoire in a Gospel album. The opening number "Magnificent Sanctuary Band" is pretty lively stuff but, fortunately for the more conservative audience, the style gradually moderates:

Magnificent Sancturary Band — Jesus Is A Soul Man — He Is My Everything — Be Ready — Just A Closer Walk — Wait A Little Longer — Onward Christian Soldiers — Afraid To Rock The Boat — Jesus Is The Bridge Over Troubled Water — I Know Who It Is — Put Your Hand In The Hand.

Despite an unpromising start, the album got to me, the longer I listened. Right out of the top drawer as a performance, it wraps up elements of protest, negro, and old-fashioned Gospel in a modern format that cannot fail to have a fairly wide appeal. Well worth a hearing. (W.N.W.(

Instrumental, Vocal and Humour

VIOLIN CONCERTOS in E minor (Mendelssohn) and G minor (Max Bruch). Yong Uk Kim, violin, and the Bamberg Symphony Orchestra conducted by Okko Kamu. Stereo, DGG 2530 224.

These two violin concertos have the same kind of popularity as the Grieg and Schumann A minor piano concertos, and just as the two piano works are often coupled, so are the two violin concertos. However, it is some time since I last saw this coupling, and this is possibly one of the few recordings offering the advantages of the latest recording techniques. Coming as it does from the DGG studios, it is almost superfluous to say that the sound quality is excellent.

The soloist in both works is a young

Reviews in this section are by Neville Williams (W.N.W.), Harry Tyrer (H.A.T.), Leo Simpson (L.D.S.) and Gil Wahlquist (G.W.).

VARIETY FARE . . . cont

Asian, whose nationality is not disclosed. Yong Uk Kim has the typical features of oriental soloists — smallish tone, but very sweet, finely judged phrasing and no extravagant emotionalism. I think he must be a very shy person, as he is one of the most self effacing soloists I have ever heard. He sounds almost apologetic when he has to take the limelight and when he is playing with orchestral support, he seems to be trying to lose himself by blending in with it to the greatest possible degree. If the DGG recording engineer tried to spotlight the soloist in the typical fashion of this company, the soloist has succeeded in foiling him in his attempts. The conductor here is also Asian, and under his direction the orchestra provides sympathetic support for the unassuming soloist. The recording is of excellent quality. (H.A.T.)

★ ★ ★

STUDIO TWO CLASSICS. Stereo, Columbia series 275 SOEX-9849.

This is almost as much a round-up of well-known orchestras and conductors as it is of composers and their music. If I might be allowed liberties in abbreviation, you will see what I mean: Chabrier: Espana Rhapsody (Orchestre de Paris; Jacquillat) — Grieg: Peer Gynt — Stormy Night (Halle; Barbarolli) — J. Strauss II: Tritsch-Tratsch Polka (Scottish National; Gibson) —Saint-Saens: Danse Macabre (Bournemouth Symphony; Silvestri (—Delibes; Sylvia — Cortege de Bacchus (New Philharmonia; Mackerras) — Copland: Rodeo — Hoe Down (Concert Arts Symphony; Irving) — Tchaikovsky: Nutcracker, Pas de Deux (Royal Philharmonic; Boult) — Reznicek: Donna Diana Overture (Royal Liverpool Philharmonic; Groves) — Mascagni: Cavalleria Rusticana — Intermezzo (Bavarian State Opera; Patane) — Coates: A London Suite — Knightsbridge March (Royal Liverpool Philharmonic; Groves).

Without seeking to comment on individual tracks, the performances are uniformly good, the recording is excellent, the playing time is generous, and the jacket notes make relevant comment on each item. At the budget price — excellent value. (W.N.W.)

★ ★ ★

MENDELSSOHN'S GREATEST HITS. Various orchestras. Stereo, RCA Red Seal LSC-5016.

One of RCA's "Greatest Hits" series, this album presents popular snippets from the compositions of Felix Mendelssohn. To list them briefly, the tracks include: War March of the Priests — Midsummer Night's Dream: Scherzo and Wedding March — Spring Song — Symphony No 4: Saltarello: Presto — Scherzo In G Minor — Violin Concerto: Andante; Finale — Spinning Song — Piano Concerto: Finale.

The orchestras and conductors are well known: Boston Pops / Fiedler; Chicago Symphony / Martinon; Boston Symphony / Munch; Boston Symphony / Steinberg; London Symphony / Ozawa; London Symphony / Previn. Featured artists include Erick Freidman (violin) and pianists Alexander Brailowsky and Joseph Kalichstein.

For such an array of orchestras, conductors and featured artists, the performances leave little to be desired and the recording itself is well up to standard. Despite the gimmicky title and jacket notes, the album is well worth a hearing if you like your classics in easy (and, in this case, varied) instalments. (W.N.W.)

★ ★ ★

THE WORLD OF BALLET, Vol 3. The Paris Conservatoire Orchestra conducted by Anatole Fistoulari and the Israel Philharmonic Orchestra conducted by Jean Martinon, Stereo, Decca SPA 203, Series 275.

The major attraction for most people in this selection will, I feel, be the ballet music from Massenet's "Le Cid", an opera about the exploits of the legendary hero figure of 12th century Spain. Despite the epoch depicted, the music is definitely 19th century Spanish in style. Items 2 to 8 are included here, and very well played by the Israel Philharmonic under Martinon. All the other items are played by the Parisians, not one of my favourite orchestras, but certainly a very competent group of players. The titles are: Dance of the Moorish Slaves; March and Ballet, from Aida (Verdi) — Dance of the Persian Slaves from "Khovanschina" (Moussorgsky) — Bacchanale from "Samson and Delilah" (Saint-Saens) — Passo a sei and Soldier's Dance from "William Tell (Rossini). (H.A.T.)

★ ★ ★

JANET BAKER — Songs and Arias. With various artists and orchestras. Stereo, His Master's Voice SOELP 9853.

This is really a sampler collated from earlier Janet Baker discs and covers a wide range of the artist's extensive repertoire, taking in songs, lieder, cantatas, oratorio and opera. For a mere $2.75 it is a disc which every music lover will want, and as an introduction to the superb artistry of Janet Baker it will give many hours of pleasure. The contents: Fain Would I Wed (Campian) — My Lovely Celia (Monro) — Ah Crudel (rec and aria Non Sdegnerai d'Amar . . . Di Quel Bel Che il Ciel) from Cantata No 1 (Handel) — O Rest in the Lord from "Elijah" (Mendelssohn) — Morgen (R. Strauss) — Claire de Lune (Faure) — Villanelle from "Les Nuits d'Ete" (Berlioz) — Pluton Semble M'Etre Propice from "The Trojans" (Berlioz) — Ich Bin Der Welt Abhanden Gekommen (Mahler) — Where Corals Lie from "Sea Pictures" (Elgar). The excerpts are all from modern recordings, and the sound is consistently good. One point worth mentioning — the incomparable Gerald Moore accompanies in some tracks. (H.A.T.)

★ ★ ★

J. S. BACH IS ALIVE AND WELL AND DOING HIS THING ON THE KOTO. Stereo, RCA Red Seal LSC-3227.

Despite its garish title, this disc contains some nicely wrought music played very delicately by an ensemble of traditional Japanese instruments supplemented by some modern Western ones. The Japanese side is represented by two kotos, which are a stringed instrument played rather in the style of a zither, and a shakuhachi—a flute type of instrument. The Western touch is provided by guitar, bass and drums. With this line up, the performers present unusual but still distinctly recognisable versions of

(Continued on page 92)

Budget-price classics

PIANO CONCERTO IN A MINOR (GRIEG) and Scherzo (Litolff). Peter Katin, piano, with the London Philharmonic Orchestra conducted by Colin Davis.

PEER GYNT SUITE No 1 (Grieg). The London Symphony Orchestra conducted by Oivin Fjeldstad. Decca SPA 170 Series 275.

I am glad to be able to give Peter Katin a better rating here than was possible in the disc of the Tchaikovsky Piano Concerto reviewed recently. This is a bright and optimistic performance, cleanly played and entirely satisfying. The concerto is contained complete on side 1, and side 2 has a lively performance of the popular Scherzo from Litolff's Concerto Symphonique No 4; and the four items of Peer Gynt Suite No 1: Morning — Death of Ase — Anitra's Dance — In the Hall of the Mountain King. As is mostly the case with this Decca "World of the Great Classics" series, the sound is dated but clean. (H.A.T.)

★ ★ ★

BIZET — Symphony No 1 in C, and excerpts from A Midsummer Night's Dream, incidental music (Mendelssohn). The Chicago Symphony Orchestra, conducted by Jean Martinon. Stereo, RCA Victrola VICS-1628.

There are not many recordings of Bizet's delightful little C major symphony around, so this budget priced Victrola is very welcome, particularly when played as well as here. The Chicago players are not so cold as many American orchestras, and infuse a warmth into this performance without which it would seem very unsubstantial. The ease with which the string sections cope with the faster passages puts one in mind of the Cleveland Orchestra, renowned for their precision. The woodwinds also do well in the plaintive second movement.

On the reverse side, the excerpts from Mendelssohn's "Midsummer Night's Dream" go very well indeed. However, on this budget price disc you get budget price sound, and this is particularly noticeable in the restricted dynamic range — for example the change in level from the opening pp string passage to the ff tutti in the Overture is ridiculously restricted. There is noticeable distortion in some parts, particularly towards the centre on both sides. (H.A.T.)

★ ★ ★

Beethoven — Symphony No 3 "Eroica" The Boston Symphony Orchestra, conducted by Charles Munch. Stereo, RCA Victrola VICS-1626.

This disc is from the same stable as the Bizet disc reviewed above, but it does not suffer from the disadvantages of poor quality sound, and although this must be a reissue, the sound is very good, with adequate dynamic ranges and no noticeable distortion. Moreover, the Boston players present an admirably virile performance of this great masterpiece proving once again that they are one of the great orchestras of the world. Unfortunately the second movement has to be interrupted for the turnover. This is one of the problems of recording this symphony and it seems an insuperable one, if it is to be accommodated on two sides. At its modest price, this disc can certainly be regarded as a bargain. (H.A.T.)

★ ★ ★

ADAM HARASIEWISZ — Piano works of Brahms and Liszt. Stereo, Philips "Universo" series 6580 049.

Brahms is represented in this selection by his "Variations on a Theme by Paganini", in which the theme, as is well known, is the same as Rachmaninoff used for his variations for piano and orchestra. Liszt is represented by the seldom played Hungarian Rhapsody No 11 in A minor, the very popular Hungarian Rhapsody No 6 in D flat, and the old pianists' warhorse, the "Mephisto Waltz No 1".

Adam Harasiewisz is a very fine Chopin performer, but I had not previously heard him play Brahms. His style in the Brahms' Paganini Variations is certainly different from that of other pianists I have heard in recent years, being rather on the lightweight side, and with the lyrical aspects prominent. However, to my mind Brahms can stand a lighter touch, and if you have no preconceived ideas, this could very well become a favourite performance. I think a bit more drama in the Liszt would have been preferable, but my opinions have no doubt been coloured by the superlative performance by France Clidat I have heard recently. I think this is one you should try to hear, at least in part, before purchase. The sound is of excellent quality and the piano tone well recorded. (H.A.T.)

VARIETY FARE . . . cont

the following Bach pieces: Toccata and Fugue in D minor — Jesu, Joy of Man's Desiring — Prelude No 1 — Sleepers Awake — Polonaise — Bourree — Two Part Invention No 1 — Air on the G String — Minuet in G — Arioso — Gavotte — Bouree — Minuet in G minor — "Little" Fugue in G minor.

It might seem gimmicky, but it sounds well, and it all has a kind of delicacy which should silence critics of bowdlerised classics. The sound is excellent. (H.A.T.)

★ ★ ★

IN CONCERT. James Last. Stereo, Polydor 2371 191.

This is virtually a sequel to James Last's very successful "Classics Up To Date" disc, featuring well known light classics played fairly straight with added rhythm. This is a formula which is being widely used nowadays, and record buyers will presumably be aware if this treatment appeals to them. If it does, there is no better exponent of the art than James Last, so if the titles appeal, buy with confidence: L'Arlesienne — Moonlight Sonata — Ritual Fire Dance — Fur Elise — Pastorale (L'Arlesienne Suite) — Cappriccio Italienne (Tchaikowsky) — Tristesse — Turkish March (Mozart) — Toccata and Fugue in D Minor (Bach). James Last's arrangements and the playing of the orchestra are of their usual high standard, and the Polydor sound is excellent. (H.A.T.)

★ ★ ★

CHANGES. John Williams, guitar, with Stanley Myers and Orchestra. Stereo, Cube (Phonogram Recordings) 2326 005.

Australian guitarist John Williams, who is now recognised as one of the world's leading classical guitarists, here does a complete about face and presents a selection of music in the popular idiom, some of it a bit way out, but in general related to the ballad and folk song style. Strangely, he does not sound in the least self-conscious in this, and his faultless technique and expressive style lends itself very well to this field of music. He is supported by a very imposing list of musicians, among whom is numbered the former Australian concert violinist Alan Loveday.

The titles: Bach Changes — Theme from "Z" — Cavatina — Spanish Trip — Because — Raga Vilasakhani Todi — Woodstock — Good Morning Freedom — Nuages — Sarabande — New Sun Rising (House of the Rising Sun). There is a wide variety of moods expressed here, and space does not allow any individual description. However, I do suggest you ask for a demonstration when next visiting your record dealer. The sound is excellent. (H.A.T.)

★ ★ ★

TOUR DE FRANCE. Willy Glahe, accordion, and his Musette Ensemble. Stereo, Decca SKLA 7680.
DANCING FINGERS. Willy Glahe, accordion, with rhythm. Stereo, Axis 6027.

Willy Glahe's style of music is simple, uncomplicated and happy, played in straightforward style, without swing, in the German cafe tradition. He does not attempt anything spectacular in his playing, but

simply provides very pleasant music, with the accent on melody throughout. The two records under review here are typical. The Decca disc has popular French melodies, a generous 14 in number, in continental "musette" style, including C'est Si Bon — La Vie en Rose — Parlez Moi D'Amour — Les Trois Cloches. The budget-price Axis disc has well known German polkas and waltzes, played in the rather livelier beer hall fashion, again 14 tracks, and including Beer Barrel Polka — Snow Waltz — Pennsylvania Polka — Cuckoo Waltz — Too Fat Polka — Annen Polka — Anneliese.

If you are interested, but want only one, the following may help you decide which to have: the Axis disc costs only $2.50, the Decca is $5.75. Despite this big difference, there is little to choose between the two either musically or technically. Both are excellent in both respects. Unless you are particularly keen on French tunes, the choice would appear obvious. (H.A.T.)

★ ★ ★

WENN ES NACHT WIRD IN DER STADT. Caterina Valente. Stereo, Decca SCLA 7046, Series 275.

New discs from that fine artist Caterina Valente are few and far between nowadays, so her fans will be grateful for reissues such as this, particularly if they missed them first time round. Valente sings entirely in German in this selection, which may limit its appeal a bit to those not of Continental origin, but there is the same stylish phrasing and timing to be found in this artist's other discs. The titles may not mean anything to you but here they are: Wenn es Nacht Wird in der Stadt — Wer War der Mann Neben Mir — C'est Tres Chique — Sailors Nightclub in San Francisco — Charley, Zund die Kerzen An — In Allen Kneipen von Soho — Der Abend Wird Schon — Blauer Asphalt — Julius, Ach Julius — Schone Schwarze Rose — Mexicaner Wein — Wenn es Nacht Wird in der Stadt (reprise). The sound is of good standard. (H.A.T.)

★ ★ ★

FIDDLER ON THE ROOF. The Mike Sammes Singers conducted by Camarata. Stereo, Axis (EMI) 6016.

Like a great many other people, I thoroughly enjoyed "Fiddler On The Roof" and I did not need to be coerced into listening to this album of music from the show. It is performed very smoothly and sympathetically by the Mike Sammes Singers who select: Tradition — Matchmaker — Sunrise, Sunset — Fiddler On The Roof — If I Were A Rich Man — Do You Love Me — Miracle Of Miracles — Anatevka.

The eight tracks play for a modest twenty-four minutes but the quality is first rate and at the Axis budget price it is still good value. (W.N.W.)

★ ★ ★

LOVE IS A MORNING SUNRISE. James Pegler. Stereo, Polydor 2907 003.

Recorded at United Sound Studios in Sydney, this new Polydor album features that very accomplished vocalist James Pegler. In keeping with the mainly romantic themes, the potentially powerful baritone voice is restrained, giving place to an intimate close-mic quality.

The 14 tracks include: Love Is A Morning Sunrise — Cherish — Ann — My Boy — Talking In Your Sleep — Try To Remember — When I Love Her — L'Amour Est L'Enfant De La Liberte — Amazing Grace — Ten Girls Ago — Once In A Lifetime — Love Of A Gentle Woman — Back Step — My Way.

Some might feel that the orchestra overrides the voice at times but, apart from that, the recording is clean and noise-free. Easy listening. (W.N.W.)

★ ★ ★

THE GREAT HITS OF COLE PORTER. The Living Strings and the Ray Ellis Strings. Stereo, RCA Camden CAS-2522.

One might infer from the credits that RCA engineers have assembled this new Camden album from existing tapes of the Living Strings under Johnny Douglas (with and without trumpet) and of the Ray Ellis Strings. Be that as it may, they have come up with a bright, tuneful recording that makes pleasant listening at the budget price.

The Cole Porter selection includes: Night And Day — C'Est Magnifique — So Nice To Come Home To — I Love Paris — In The Still Of The Night — Easy To Love — Begin The Beguine — True Love — I Get A Kick Out Of You.

The surface is good and the sound itself is of good average quality. (W.N.W.)

★ ★ ★

SUPER STAR SOUND. Les Humphries, piano. Decca stereo SKLA 7683.

Les Humphries is an up and coming music arranger who has apparently decided to go on record. It appears his decision is a good one for he definitely has talent as a pianist and arranger. In fact, I would prefer to hear a little more of his piano and less of the orchestra that accompanies him. Apart from this, it is a record worth listening to. Recording quality is normal.

Ten tracks are presented: Classical Gas — Cast Your Fate To The Wind — Scarborough Fair — Ramsey's Back — Wichita Lineman — The Frog — Piano Concerto — Up, Up And Away — Fantasia Impromptu — Oh Happy Day. (L.D.S.)

★ ★ ★

BRAND NEW GIRL. Yuri Nishimura at the Yamaha Organ. Stereo, Interfusion (Festival) SITFL-934577.

In 1970, while still in her late 'teens, Yuri Nishimura won the Yamaha contest against competitors from all over the world. Since then, she has toured with American organist Jimmie Smith, has featured widely on Japanese radio and television and has recently visited Australia. A new girl, to be sure!

Working with a strong background of percussion and bass, she provides the lead in a combo sound, rather than featuring as an organ soloist in this particular album.

The titles: Love — The Music Played — Super Star — She's My Kind Of Girl — Super Bird — I'd Like To Teach The World To Sing — Stones — Hurting Each Other — Mother And Child Reunion — Brand New Kay — Sweet Seasons — Without You.

Yuri Nishimura leaves no doubt as to her skill at the console and the sound is pleasant and clean. But, if you're primarily an organ fan, best you check to see if it's the kind of sound you want. (W.N.W.)

★ ★ ★

THE BRASS MENAGERIE 1973. Enoch Light and Light Brigade. Project 3 stereo SPJL-934493. (Festival Records Pty Ltd).

Enoch Light was one of the pioneers of stereo recording technique. He started it all in 1959 with a disc called "Persuasive Percussion" which abounded in gimmicky recording effects. Unfortunately, much of the public appetite for this sort of stereo program has dwindled so that Enoch, in serving up more of the same on this album, sounds old hat.

The recording quality is excellent and the stereo effect multichannel and gimmicky. If you like his earlier albums, you'll like this one. If not, you'll hate it.

Eleven tracks are featured: Mambo — Macarthur Park — I Feel The Earth Move — Season Of The Witch — Hot Pants — Theme from "Shaft" — Proud Mary — The

(Continued on page 97)

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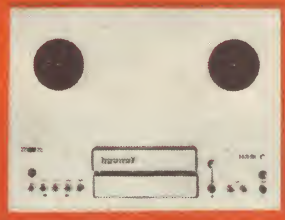

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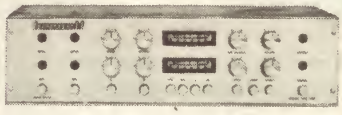

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WA: Athol M Hill and Co 1000 Hayes St Perth 6000. **Tas:** United Electronics 23A Frederick St Launceston 7250

AV51

VARIETY FARE . . . cont

Night They Drove Old Dixie Down — Boy Meets Horn — Sweet Julie — Explorations for Moog. (L.D.S.)

★ ★ ★

BEACH PARTY 2. James Last. Polydor 2371 188

There is no doubt that James Last can certainly produce some exciting records for listening and dancing when he sets his mind to it. But apparently he was not in the mood for it this time. The pop tunes he has chosen are banal to say the least and where he has chosen an evergreen such as "South Of The Border" his singers have ruined it.

Neither is the recording quality up to the usual Polydor standard although surface noise on our sample pressing was negligible. The rest of the tracks are: Hot Love — Here Comes The Sun — I am-I Said — Me And You And A Dog Named Boo — Power To The People — Joy To The World — Butterfly — On The Beach — Chirpy Chirpy Cheep Creep — Jamaica Farewell — The Dock Of The Bay. (L.D.S.)

★ ★ ★

THE BEACH BOYS' GREATEST HITS. (1961-1963). Scepter stereo SJL 934472 (Festival Records Pty Ltd).

Were you a "Surfee" back in 1961? If so, you may be interested in this record from one of the groups that was very popular at the time. Apart from this, the album will be of little interest to today's pop music fans, although it does demonstrate the tremendous change in "taste" over ten years.

Recording quality is of a normal standard. Three of the tracks are instrumental arrangements by the "Surfin' Six": Little Deuce Coop — 409 — Karate. The rest of the tracks are: Surfer Girl — Barbee — Luau — Surfin' — Surfin' Safari — Judy — What Is a Young Girl? (L.D.S.)

★ ★ ★

L'ENFANT ROI. Franck Pourcel and his Grand Orchestra. Columbia stereo SCXO-8003.

Franck Pourcel is certainly a prolific arranger and conductor and his records have deservedly become very popular over the last two years or so. However, not all his albums are of a high standard and this one must be regarded as a fairly routine disc as far as the quality of the arrangements is concerned. The sound quality is good and the stereo spread wide and even.

Twelve selections are featured: L'enfant Roi — Mamy Blue — Don't Let It Die — "Opus 35" Tchaikovsky — We Shall Dance — Io E Te — Jesus Christ Superstar — Venise Va Mourir — Charlie — Comme Juliette Et Romeo — The Fool — Butterfly. (L.D.S.)

★ ★ ★

THE CRAZY WORLD OF MARTY FELDMAN. Decca stereo SPA 134.

"The Crazy World of Marty Feldman" has some very apt self-description on the envelope comic strip. At one point it states that Marty Feldman has a mouth from which ". . . emanates the sounds you will hear if you are fool enough to play this record". ". . . and for maximum listening pleasure you should be cosy, relaxed and very, very drunk". I heartily agree. You need to be. (L.D.S.)

HITS OF THE 70's. The Hollyridge Strings conducted by Stu Phillips. Capitol stereo ST 883.

Need some background music for dining or quiet relaxation? This album will fit the purpose admirably. A well conducted string orchestra backed by a humming chorus sums it up. Recording quality and stereo spread are fine throughout the disc.

There are ten tracks: Theme from "Love Story" — Imagine — It's Impossible — Theme from "Summer Of '42" — Bridge Over Troubled Water — We've Only Just Begun — If — It's Too Late — Superstar — Theme from "Shaft". (L.D.S.)

★ ★ ★

THE LAST PICTURE SHOW. Hank Williams. MGM Mono 2315 077.

Everything in country music today is descended from the style of Hank Williams as presented on this album. The producer of this movie used the songs of Williams to epitomise the feelings of the times in the early fifties in which the movie is set.

The singing of Williams is very much a part of the film. "Hey Good Lookin' ", "Lovesick Blues" and "Cold, Cold Heart" now stand as examples of folk art, cameos of an all but pushed aside culture.

Williams died in 1953 before the LP record and stereo era began. The originals have been re-mastered to "simulate stereo". As a confirmed eater of bread with the crusts on, I would have preferred the dics as Hank Williams recording them. This is another case for re-pressing of the 78s. (G.W.)

Jazz and Rock . . .

LOUIS ARMSTRONG. Historical re-issue. RCA Mono VPM-6044.

This is one of the many volumes which is making its appearance following the death of the great jazz trumpet player a year ago last July. The selections in this album fill the gap between the Hot Five and Hot Seven releases and the many series made with the All-Stars. The discs cover from 1933 to 1948. They start with "You'll Wish You'd Never Been Born" recorded in Chicago in 1933.

After the fire of the Hot Seven releases, these discs were under-rated by listeners. Yet in the early thirties he was still playing with great individuality and invention.

The arrangements on some of these performances. ("Mississipi Basin" for instance) were unlike any other Louis was to use. They had the dark hues of the Ellington and Lunceford bands.

This selection skips the Hollywood days. They are well represented on other anthologies. There is a thoughtful selection of some of the All-Stars tracks which Louis recorded with Velma Middleton and Jack Teagarden. Louis had returned to his New Orleans style by this time and he was singing more in a voice which phrased like a trumpet. His tonality was extraordinary, a whole blues experience in itself.

We don't often review a mono disc these days. I'm pleased that the RCA people haven't added that phrase "electronically re-processed for stereo".

I'm afraid that I am one of the purists when it comes to mono recordings. I don't want them tampered with. They were produced and balanced by artists. What I would like to suggest is that the companies owning the precious masters of some of

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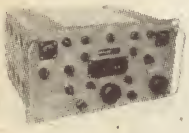

R.390 Series Communications Receiver

The R390A communications receiver, long used for military surveillance of discrete frequencies between 500 kHz and 32 MHz, is available now at but a fraction of its worth.

Providing digital readout with an accuracy to 300 Hz, the R390A is the latest and best made general coverage communications receiver that you can buy: Robustly constructed on sub-assembled units this receiver provides unequalled stability and maximum flexibility of controls. Six degrees of band pass from 100 Hz to 16 kHz and two positions of audio filtering enable this set to be used for the most sophisticated moon bounce conversion purposes all the way down to deluxe short wave listening.

Mechanically this receiver is a marvel of gears, ratchets, and cams providing ferrite slug tuning of both the front end and one of the triple conversion IF stages.

There are two audio systems within the set, one intended for feeding a monitored 600 ohm telephone line and the other used for a local loud speaker loop. Two meters are provided, one measuring the incoming RF signal and the other the level of audio set to fit a 600 ohm line. The balance of this set is impressive, the knobs for example having been designed for maximum comfort. The controls are not so closely set that any of them are awkwardly adjusted. There is, of course, a dial lock and a means of zero adjusting to the extremely high quality calibrator circuit provided internally. There is, of course, the antenna trim control and the AGC slow, fast, and medium control. The very effective noise limiter is built in and of course the receiver is designed to be used with associated transmitters and is therefore provided with a muting circuit.

Both balanced and unbalanced antenna inputs are available, and there is an IF output at 50 ohms to enable the receiver to function with a spectrum analyzer or a panoramic adaptor.

Perhaps one of the most unusual advantages of the receiver is its extreme stability, it is so good, for example, that you can pretune the receiver to any choice frequency such as WWV even while the set is cold and in off position. Turning on the set and then turning up the audio control will reveal the desired signal perfectly tuned in. So accurate is this presentation that you can literally use the receiver as a frequency meter. This unusual stability is achieved by a combination of superb mechanical engineering and very expensive permeability tuned oscillators one to which is used as a VFO control while the main one, of course, is ganged mechanically with a kilocycle change knob.

Thermostatically controlled ovens enclose both PTOs and the crystal oscillator circuitry. The R390A can be used remotely with suitable signal circuit control connections to terminals of the set. Although the set was designed for CW, MCW, AM, FSK and SSB, it does not contain a product detector. This is the ultimate communications receiver priced at a figure that serious-mineded individuals can afford. It is the kind of set which will last years and years and years. Indeed there would be no normal reason for ever wanting to replace such a set for the generally available merchandise made these days does not begin to approach in quality or performance what you can expect from the R390A.

R390A RECEIVER TECHNICAL CHARACTERISTICS

Type of circuit — Triple-conversion superheterodyne on eight lowest frequency bands; double-conversion superheterodyne on all other bands.

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Types of signals received— A1, cw; A2, mcw; A3, voice; A9, single side-band, FL, freq-shift keying.

Type of tuning — Continuous; frequency read directly on counter-type indicator.

Method of calibration — Built-in crystal-controlled.

Calibration points — Every 100 kc.

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VARIETY FARE . . . cont

these original records actually get hold of some biscuit and press 78s for enthusiasts like myself with good acoustic gramophones. I will back the reed sound from the tuned tin horn on my old reproducer against any electronically reproduced gimmickry for accuracy of tone and lifelike sound. (G.W.)

★ ★ ★

FIRST LIGHT. Freddie Hubbard. CTI Records stereo 6489 012.

Hubbard is the most outstanding of the cool trumpet players. He has been crisp and clear in his ideas where Miles Davis has been fuzzy and introverted.

This album is both a recording feat and a jazz feat, combining a rewarding breadth of sound with faultless intonation on the trumpet and flugelhorn by Hubbard.

He plays five numbers only, all of them being in the form of extended theme and variations with a large orchestra in accompaniment.

Hubbard's own composition "First Light" which opens the recital is the best performance.

I'm delighted that Hubbard has recorded the McCartney's tune "Uncle Albert/-Admiral Halsey". McCartney used the device of a busker's trumpet as part of the eclectic which made up this record and Hubbard has risen to the bait admirably. Hubert Laws on flute is the other main jazz soloist and he plays well on this track.

The other numbers are "Moment to Moment", "Yesterday's Dreams" and "Lonely Town". (G.W.)

★ ★ ★

SCIENCE FICTION. Ornette Coleman. CBS stereo SBP 234104.

It's all a matter of listening closely to Ornette Coleman for a while and you eventually learn to follow his ideas through jazz lines which are as close to free form as you will get.

Alto saxophone player Coleman modulates from two or three keys at a time to other keys. Once you have caught his particular cloud the listening has a refreshing and stimulating effect on the mind.

He records with both large and small groups. I found that the best tracks were cut by a quartet of Coleman, Don Cherry on pocket trumpet, Charlie Haden on bass, Billy Higgins on drums.

It's easier to detect the influences of blues and be-bop in the quartet tracks, called "Civilisation Day" and "Street Woman"

Poet David Henderson is heard in the free form "Science Fiction" track and Indian pop singer Asha Puthli performs vocal jazz as part of the big band. The drumming on the vocals is unusual, with Billy Higgins playing a speech rhythm. (G.W.)

★ ★ ★

MACHINE HEAD. Deep Purple. Purple Records stereo TPSA 7504.

The capabilities of the portable recording gear possessed by the Rolling Stones is demonstrated on this record by another group. Deep Purple were all set to record at Montreux, Switzerland, when the recording studio was burnt out. The Stones loaned them their mobile unit and the record went ahead.

Of the heavy rock groups, Deep Purple are the most durable. "Highway Star" which opens the disc, sets a cracking pace. It is something of a send-up. The keyboards and amplified strings which make up the group are all performed with an ear to melody. The lyrics on things like "Pictures of Home" are light, like those early Beatle numbers. (G.W.)

★ ★ ★

BONZO DOG BAND. United Artists stereo SUAL 934508.

Pop music is such a mixture of send-up and serious that the band which sets out to send it up runs the risk of being taken seriously. Not so the Bonzos, an English group of knockabout musical clowns. Vivian Stanshall and Neil Innes are the leaders. The Bonzos have a stage act in Britain and the humour comes over well in these studio performances.

"Rawlinson End" is based on those endless domestic dramas on TV which go from situation to situation. "Waiting for the Wardrobe" is a suspense thriller. It wouldn't be giving anything away if I told you that it ends when the furniture man delivers the new clothes closet.

Johnny Cash gets his due in "Bad Blood", a take-off on those prison songs. "King of Scurf" starts out like a song from the Beach Boys, complete with counter-tenor. It doesn't end that way. (G.W.)

★ ★ ★

THE SHIP. Southern Contemporary Rock Assembly. Atlantic stereo SD 1007.

Australia's most successful rock show band comes through with outstanding quality on this LP recorded at United Sound, Sydney. There was a remix done in New York but just what effect this has had we cannot say.

Members of SCRA are Mickey Leyton and Ian Saxon with Sheryl Black on vocals, Peter Martin and Jim Kelly (guitars), Dave Ellis (bass), Ian Bloxsom (percussion), Mick Kenny (trumpet) and Greg Forster (harmonica). Russell Dunlop's drumming propels the band forward with great syncopated rhythm and Don Wright's reed playing gives the band a jazzy feel.

The larger than life polish of the band seems to suit an ironic lyric, and SCRA give us this with two very good tracks "Actress" and "Something Like the Feeling". "Our Ships" and "Changes" are two outstanding travel ballads. (G.W.)

★ ★ ★

LOVING IS HARD. Tully. Harvest stereo SHVL 607.

This Australian sextet puts the emphasis on communication and you get the feeling that the band is getting through to you without going in for a lot of tricks. Their LP shows the group members performing in their own individual styles.

"Love Can Take You", "Loving is Hard", "The Real You", "Poco Poco"; "Ice" and the other numbers on the album each have their own particular style. They are thoroughly musical, featuring both Richard Lockwood and Michael Carlos on piano at times, Ken Firth on bass, Colin Campbell on guitars and Shayna Stewart with vocals. Keith Barber and Russell Dunlop sat in on drums.

John Taylor recorded the album at EMI, presumably with eight-track recording console. The mix allows the listener to follow and evaluate the performance of each instrument. (G.W.)

SPEAKER ENCLOSURES

MAGNAVOX 8 / 30 SYSTEM

1.6 cft complete $58.00ea. Magnavox Speakers 8 / 30 $17.00 p.p. $1.50
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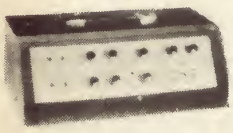

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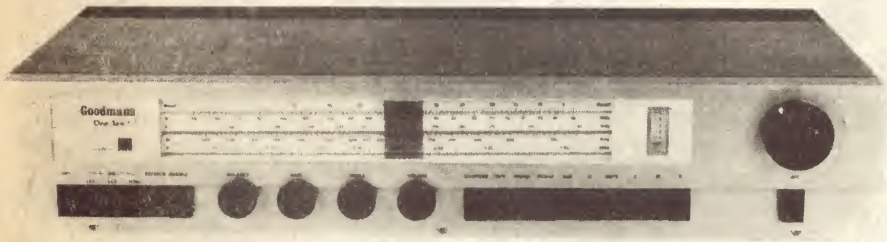


Goodmans One Ten: superb reproduction

New tuner-amplifier delivers 30 watts per channel at less than 0.01% distortion, 50 watts per channel at less than 0.1%. The tuner covers three AM bands and the international FM band.

The model One-Ten has a streamlined appearance, enhanced by the somewhat longer than usual length. A brushed aluminium front panel complements the teak veneered cabinet. The overall dimensions are 23 x 12 x 4½ inches (L x D x H), or 584 x 305 x 115mm.

The dialscale and tuning meter are visible through an acrylic window in the top of the front panel. A large tuning knob is situated to the right and in line with the dialscale. The dialscale is calibrated for LW(150-265kHz), MW(525-1605kHz), SW(5.9-6.25MHz) and FM(87.5-108MHz).

The lower part of the front panel is recessed, and features the four rotary controls and seventeen pushbuttons. The rotary controls are conventional stereo controls, while the pushbuttons allow selection of speakers (there are two sets of stereo speaker outlets), mode (including all radio bands), and filters. There is a push-button for power, and one for AFC when listening to FM. Two headphone sockets are provided behind a plastic cover at the side of the unit.

There are three DIN sockets at the back of the unit for tape, magnetic cartridge and ceramic cartridge inputs. The tape DIN socket also provides output for recording.

Goodmans' specification for the One-Ten is quite an impressive one, but our tests on the sample unit showed that it easily lives up to the quoted figures. The only figures that we were not able to directly verify were those for signal-to-noise ratio, which Goodmans quote in terms of weighted figures taken using a filter as per the DIN 45500 standard. However our unweighted figures were sufficiently close to those quoted to suggest that the One-Ten easily meets its specification here also.

The specification claims 50 watts RMS output per channel for less than 0.1% total harmonic distortion, and 30 watts RMS for less than .01% distortion, into 4 ohm loads at 1kHz and with both channels driven. Under the same conditions we obtained 50W RMS per channel for .02% distortion, while the distortion for 30W output was so low that we could not make a reliable measurement — certainly it was less than .01%. The output capability and distortion level therefore easily exceeded the maker's claims.

Quoted bandwidth is 15Hz to 45kHz (+3dB) and 20 Hz to 20kHz (+1dB), with power bandwidth substantially the same. The sample unit met these figures quite easily, although it became somewhat embarrassed when we were checking the upper limit of power bandwidth — a point of only academic interest.

The weighted signal-to-noise figure specified for the tape or auxiliary input is 80dB, and that for the magnetic pickup input 70dB. Our unweighted test figures were 75dB and 65dB respectively, still very good indeed. Channel separation at 100Hz, 1kHz and 10kHz was found to be 46dB, 56dB and 50dB respectively, again very impressive.

Bass control range was ±18dB at 35Hz and treble control range at 10kHz was ±10dB. The scratch filter attenuation at 6kHz was 4dB and at 9kHz 36dB, while the rumble filter attenuation at 45Hz was 4dB and at 10Hz, 36dB.

We tested the tuner specifications on the MW band. Sensitivity was verified as 20uV for better than 20dB signal-to-noise radio measured at the tape output. The AGC efficiency was also verified. For an 80dB input change the output change was less than 10dB.

By removing four screws under the unit one can slide the cabinet away to reveal the circuitry. There are two large printed wiring boards. These boards take up all the available area, and there are very few connecting wires. Access to the underside of the boards can be obtained by removing a plate under the unit.

As the final phase of our tests we listened to the One-Ten playing some familiar discs, and assessed the radio reception. The reproduction off disc was superb, as the test results had led us to expect. With high quality loud-speakers and a good signal source even the most critical listener should be impressed.

Radio reception in our building is not optimum due to the locality and various sources of interference, however the MW reception using the inbuilt ferrite rod antenna was very good. Sensitivity and selectivity were good and there was very little noise.

Overall we were very impressed with the Goodmans One-Ten, and would not hesitate to recommend it. This unit is now available in Australia and is distributed by Thorn Electrical Industries (Aust) Pty Ltd, 123-131 Bamfield Road, West Heidelberg, 3081. Branches are located in all major cities. (G.N.)

Akai VT-700: 2 hrs of video on ¼in tape

Akai Australia have announced that they are able to supply the Akai VT-700 helical-scan VTR, which uses the same ¼-inch tape format used on their widely-known VTS-110DX portable machine. Mains operated, it features a crystal ferrite head and provision for 10½-inch spools.

The VT-700 video tape recorder uses two rotating video heads and the "omega" helical scanning format. A stationary control / audio head is positioned outside of the head drum for synchronous audio recording and playback. A full track and separate track erase head is provided for erasure of old tapes. This recorder uses a new single crystal ferrite video head, the operating functions of which are unaffected by climatic conditions. This constant performance ensures clear and precise video recording and playback. Further, the wear-free properties of the single crystal ferrite gives longer-lasting performance, and Akai claim that it virtually eliminated the need for head cleaning.

Akai has developed a ¼in video tape with performance said to be equal to that of most ½in tapes. The use of this tape cuts operating costs to the point where it is economical even compared with film. The VT-700 accommodates 5, 7 and 10½in reels, the latter size offering an extended two hours' recording time.

A sound dubbing button (and indicator lamp) enable the background music or other sound-track information to be changed. While viewing the picture on the monitor screen, replacement sound can be fed in through a line-in connection or using a microphone.

A unique feature of the VT-700 is a stand-by function which stabilises motor revolutions prior to recording or playback operation. This enables complete stabilisation of picture from the very first instant of operation.

It is possible to obtain a still picture during playback by setting a ready-still button to out and depressing the stop button. This stops reel movement but allows the still picture to remain on the sereen.

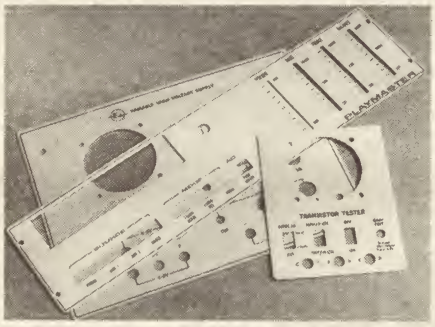
The VT-700 operates from AC mains, 100 to 240V, 50 or 60Hz, with a power consumption of 130W. The price is $772.

The VTS-110DX portable video tape recorder is of course still available. This comprises a VT-110 portable video recorder (which uses ¼in tape and includes single crystal ferrite heads), a VC-1105 camera, a

VM-110 portable monitor, and a VA-110 adapter. The complete system sells for $1518.

Further information on both the VT-700 and the VTS-110DX may be obtained from Akai Australia Pty Ltd, 276 Castlereagh St, Sydney, 2000. (J.H.)

Panels for "E-A" projects



Brushed aluminium panels for the "E-A" Variable Voltage Power Supply (Sept 71), Playmaster 132 Stereo Amplifier (June 71) and Transistor-FET Checker (Aug 71) are now available from Heating Systems Pty Ltd, 19 The Boulevarde, Caringbah, NSW 2229; also available from trade suppliers.

Rugged new power supplies from A & R

A & R Electronic Equipment have just released two new additions to their range of power supplies. One is a new version of the popular battery saver, featuring a choice of four output voltages and improved regulation. The other is a regulated power supply with an output capability of 10A at 16V.

The type PS164 battery saver supply is in a grey plastic case and features double insulation for greater safety. It is quite compact, measuring only 3½ x 2½ x 2 inches (L x W x D), or 90 x 65 x 50mm. Adjustment of the output voltage is via a screwdriver preset switch, giving 4.5V, 6V, 7.5V or 9V to suit a wide variety of equipment.

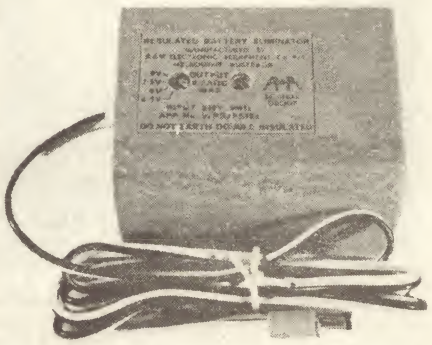
When tested in our laboratory the sample unit gave a good account of itself. Each of the four output voltages was within 0.5V of the nominal value under no-load conditions, and all were within the specified 10% of nominal value for the maximum rated output current of 300mA. Ripple at maximum current drain was less than 0.25% on all ranges, as specified.

A quick look inside the PS164 revealed that it is well engineered for reliability and safety. It should therefore be very suitable for powering any of the small tape recorders, radios and other solid state appliances which have become so much a part of modern life.

The type PS150 regulated supply is in a somewhat different category from the battery saver, being a compact but rugged lab-type supply designed for research and development laboratories, service workshops and production testing situations. It is housed in a sturdy pressed-metal case which is well vented and finished in dark grey enamel. Overall dimensions are 12¼ x 6¾ x 9¼ inches (W x H x D), or 311 x 171 x 235mm, and the weight approximately 30 pounds (13.6kg).

The unit is fully solid state and uses all silicon devices. Heart of the regulator circuit is a linear IC, which is followed by a 2N3055 transistor. This in turn drives two more 2N3055s as the series-pass elements. The circuit is arranged to provide foldback current limiting for overload protection: if the current tends to rise above 13A at the set voltage, both voltage and current decrease. Short-circuit current is 5 amps.

The two main front panel controls are those used to adjust output voltage. Coarse adjustment is by means of a switch which



selects transformer secondary taps to minimised regulator dissipation; this gives six ranges of 2V, from 4-6V to 14-16V. Fine adjustment within these ranges is by means of the second control, a potentiometer.

A single 2½ inch square meter is calibrated 0 to 20V in 5V steps with 0.5V markings, and 0 to 10A in 2A steps with 0.2A markings. A rocker switch allows one to read either voltage or current. The output voltage is floating, thus as well as positive and negative output terminals there is another for earth connection. The power switch is a toggle type and there is a red bezel for power indication.

Much of the space inside the unit is taken up by the power transformer and a large filter choke. The regulator circuitry is on a small printed wiring board.

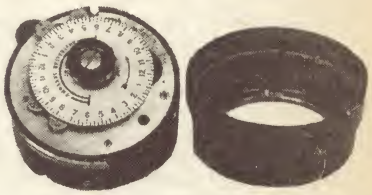
When tested in our laboratory this supply also gave a very good account of itself. Load regulation for 0-10A was comfortably within the 10mV figure quoted in the specification, on all ranges. This corresponds to 0.25% at the lowest output and .068% at the highest. Line regulation was less than 0.1% for ±10% mains variation, as specified.

Ripple and noise were less than 20mV P-P on all ranges at maximum loading, which is better than A & R's figure of 25mV. The overload protection worked exactly as claimed, and produced a short-circuit current very close to 5A.

Summarising, our tests showed that the PS150 is a rugged unit which comfortably lives up to its specs. It should be very suitable for all applications needing a foolproof low voltage supply of up to 10A capacity.

Enquiries for both the PS164 battery saver and the PS150 power supply should be directed either to A & R Electronic Equipment Co Pty Ltd, of 30-32 and 42-46 Lexton Road, Box Hill, Victoria, or to their offices at 4 Close Street, Canterbury, NSW and 470 Morphett Street, Adelaide. (G.N.)

Time clocks



Heavy duty time clocks are available for $10 plus 50c postage from Peter Broughton, 99 Sussex St, Sydney 2000.

Encel showrooms

Two views of Encel Electronics' new showrooms for display and demonstration of high fidelity components and systems. Encel Electronics has moved from Clarence St to the new premises at 260 Elizabeth St, just opposite Central Station. Encel's range of custom built hi-fi systems will be featured.

Compact CRO includes vectorscope

Compact new instrument from Japan features solid state circuitry and wide bandwidth. While very suitable for lab use, its light weight would make it ideal for servicing work. An additional bonus for colour TV servicing is a vectorscope facility for phase measurement.

The Leader LBO-301 three-inch oscilloscope is a fully solid-state instrument of very compact and attractive design. It measures only 8½ x 5¼ x 14in (L x H x D) or 216 x 137 x 356mm overall, and weighs a mere 8.8 pounds (4kg). It features an extruded aluminium front panel, which has a brushed finish with black and red lettering. The pressed metal case is finished in dark grey enamel, and is fitted with a sturdy handle which acts also as a tilting bail.

The sample instrument pictured was sent for review by Warburton Franki Ltd, who are the Australian distributors of Leader instruments.

Maximum Y deflection sensitivity of the LBO-301 is 10mV per major scale division (6mm), with a calibrated attenuator to reduce this in the usual 1-2-5 range sequence to a minimum of 5V per division. There is also an uncalibrated vernier control. Rated bandwidth of the Y amplifier is from DC or 2Hz to 7MHz, and rise time is 70ns. Direct input impedance is 1M in parallel with 40pF, which may be increased to 10M in parallel with 15pF or less with the 10:1 divider probe supplied. The input connector is of the "UHF" type.

Seventeen timebase sweep speeds are provided, ranging from 0.2s per division (again 6mm) to lus per division, with the 1-2-5 range sequence as before. An uncalibrated vernier control allows interpolation if required, and allows the lowest range to be extended down to 0.5s per division. There is also a x5 magnifier switch, which effectively extends the upper sweep range to 0.2us per division.

Timebase synchronisation is via either automatic or adjustable level triggering, with provision for external triggering if required. The triggering level control is a centre-zero type, turned in one direction for positive slope triggering and in the other for negative slope operation.

Provision is made for external horizontal sweep, quoted sensitivity being 1V P-P per division or 200mV per division with the x5 magnifier in operation. Bandwidth of the horizontal amplifier is 2Hz-200kHz.

A calibration waveform of 500mV P-P and 1kHz ±3% is provided at a front panel jack, for amplitude and time calibration.

At the back of the unit are inputs for vectorscope (R-Y and B-Y) and intensity modulation. There is also an output socket making the internal sweep sawtooth available for external use.

Our tests of the sample instrument submitted for review showed that it meets its specifications comfortably. Frequency response of the Y system was 3dB down at 7MHz as claimed, and was still usable at 9MHz. Rise time as measured with a pulse generator and tunnel diode shaper was only 40ns, somewhat better than the claimed 70ns, suggesting that the compensation is adjusted for optimum pulse performance.

Trace brightness at high writing speeds was down, as one might expect from a CRT without a PDA electrode, but we were still able to observe a single period of a 9MHz signal without difficulty.

We checked both the amplitude and time scale calibrations and these were both within the quoted tolerances of ±3% and ±5% respectively. The 1kHz calibrator output was also checked, and although its amplitude was within tolerance, its frequency was about 10% high. Not a very important point, but one which should be noted.

The timebase triggered very easily and reliably in both the automatic and adjustable level modes, and met the maker's specs regarding trigger sensitivity at various frequencies. To summarise its operation in this regard, it triggers over the range 2Hz-2MHz for a 6mm high pattern or 100mV external trigger signal, and over the range 1Hz-7MHz for a 9mm high pattern or 150mV external signal. With larger signals triggering is still reliable at higher frequencies.

Measured sensitivity of the horizontal amplifier input was 250mV P-P per division and 60mV P-P in the x5 position. Its frequency response was 3dB down at 300KHz — again somewhat better than the quoted figure.

As one might expect from a solid-state instrument of this type, its operation was very stable, and there is no sign of trace drift even from cold switch-on.

We could not check the vectorscope facility fully as a colour receiver or generator is not yet part of our equipment, but tests using conventional generator and a phase shifting network indicate that it should be satisfactory.

In short, then, we found the instrument very impressive both in its performance and in terms of its physical form. Offering as it does full laboratory performance combined with very light weight, it would be ideal for such applications as monochrome and colour TV servicing, computer maintenance and industrial electronics work.

The LBO-301 comes complete with input terminal adapter, a 10:1 divider probe with the usual assortment of tips, and three other test leads. A leather carrying case is available also, on separate order. List price of the instrument is $426.00, with quantity and trade discounts available. Enquiries should be made to Warburton Franki offices in all capital cities.(G.N.)

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12-16V, two inputs, 5mV and 100mV. Dimensions 6½in W x 3¼in H x 8½in D. 15-ohm output, No 763D, **$62**. For 125, 250, 500-ohm output, No 763A, **$64**. For 240V operation $3 extra.
10W PA amplifier similar to above, 4-ohm output, 240V operation, No 729D, **$40**. **Freight extra.**

CD IGNITION COIL

For EA (Fraser) circuit. Mounted on strong fibreglass printed circuit coded for all other components. Polyester film layer insulation. Connected and tested. For standard distributor, No 787; for photo cell distributor, No 786. **$8 each. Postage 20c each.**

R.C.S. COMPLETE DO-IT-YOURSELF KITS

Peak reception. Low price. No expensive test equipment. Everything fits. 1964 RF Transporta 7.

Complete kit — No 640 **$43.50**
Portable car radio. Identical to 640 above, plus extra switch and car coil, etc. No. 642 **$46.00**
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(Write for booklet on 640 and 642.)

NEW TRANSISTOR PREAMP KIT

SIZE 3 x 2 x 1in, 2 req. for stereo.

LOW IMP input, 2 trans, 672C	**$6.50**
Wired ready for use, 672D	**$8.00**
HIGH IMP, 2 trans, 680C	**$6.50**
Wired ready for use, 680D	**$8.00**
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Postage 10c each. Write for data.

COILS and IFs 455KHz

Aerial, RF, Osc and IFs	**$2.00**
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ALL PRINTED CIRCUITS SINCE 1960 now available

Clearly coded for easy assembly. Accurate to size. With parts list. Immediate despatch.

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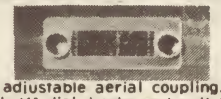
HI-FI BROADCAST TUNER UNIT
4 TRANSISTORS—HIGH SENSITIVITY



RF mixer, IF, power detector stages, adjustable aerial coupling. Complete as illust, wired and tested with 461 dial, knobs and switch pot, No. 474D, **$31. Freight extra.**
WHISTLE FILTER for above set for 8KHz bandwidth. (Can be altered to 9, 10 or 11KHz.) No. 128, **$4. Post 10c.**

10W STEREO
MULLARD
10 + 10W RMS

With output transistor PROTECTION. Frequency response 40Hz to 30KHz. Distortion 0.5 per cent. Treble, bass boost, 20dB.

Complete kit of parts, No. 480C	**$74.00**
Wired and tested, No. 480D	**$79.00**
Cabinet as illustrated	**extra $10.00**
Magnetic pickup preamp, No. 762D	**extra $11.50**
Inbuilt BC tuner with w / filter	**extra $35.00**

Plus freight. Write for brochure. For special Saturday demo, ring 59 6550.

TRANSFORMER

Tap 6V and 9V at 100mA. Filter capacitors, rectifier, resistor, etc. **$6.50. Post 20c.**

NEW STEREO MAGNETIC PRE-AMP

Hum free, 5mV input, 250mV out. Size 3 in x 2in x 1in. Wired ready for use. No. 762D. **$11.50. Post 10c.**

NOISE FILTER
for radio and TV

No. 27 line filter, 2A	**$8.50**
No. 29, 10A. No. 29B, 20A line filter	**$35**
No. 30 pulse filter, 2A	**$11.50**
No. 11 aerial filter	**$13**

Order direct. Pack and post 50c.

MAGNETIC STEREO PRE+AMP

In 5mV, out 250mV. Bass and treble 20dB

No. 724C	**$29**
Wired ready for use	**$31**

Postage 30c each.
For crystal, ceramic, No. 722D **$27**

NEW BASS BOOST
4-TRANSISTOR STEREO AMP

Unity Gain:

400Hz, 0dB	Connect between your preamp and main amp No. 791D, **$10.80.**
100Hz, 5dB	
50Hz, 9dB	
30Hz, 14dB	**Postage 20c.**

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770—71.A.8	**$2.50**
812-71.P.8	**$2.50**

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RADIO PTY. LTD., 651 FOREST ROAD. BEXLEY, N.S.W. 2207. 587 3491

NEW RANGE OF PW BOARD DRILLING MACHINES

Royston Electronics has announced additions to its range of equipment for printed wiring board fabrication.

Available are two new drilling machines for printed wiring boards. The Saunders "Dumatic" 603Mk II is intended mainly for batch production, where the required throughput would not justify programming an automatic numerical control drilling machine; or where greater security and process control is required by specialist electronics manufacturers.

The "Dumatic" 603 Mk II enables an unskilled operator, working from a template, to produce 9000 burr-free holes per hour in glass / epoxy laminate boards, accurate to within ± 0.001in (0.025mm) of specified location. A digital display indicates the total of holes drilled per board.

The "Dumatic" 614 / A (illustrated) is a comparatively low-cost optical drill with x10 magnification and bright illumination provided by a fibre optics system. Applications include making templates and prototype printed wiring boards, especially where nil heat rise from the light source is desirable, for example, when drilling directly from cellulose and other negatives.

The "Dumatic" 614 / A is now available with full instrumentation at either side of the cabinet, to monitor all functions when fabricating templates at approximately 8000 revs / min or prototype circuit boards at approximately 20,000 revs / min. A high precision housing beneath the table enables the drill unit to be rapidly changed and accurately relocated in order to suit the application. The optical system, which gives a x10 magnification, has been improved so that, after drilling, the perimeter of the hole is clearly delineated. This has

been achieved by using a multi-filament glass fibre to transmit a remotely generated 150W quartz halogen light source so that the area of the board to be drilled is brilliantly illuminated without heat.

Royston Electronics has also added to its range of WAAGE series rectangular solder tanks, which are specifically designed for printed wiring board fabrication. Boards may be dipped manually or the standard tanks may be integrated into automatic assembly systems. These tanks are available with capacities from 10lb to 135lb.

For further details of these products, write to Royston Electronics Pty Ltd, 22 Firth Street, Doncaster, Vic. 3108; or in NSW, at 17 Burwood Road, Burwood, 2134.

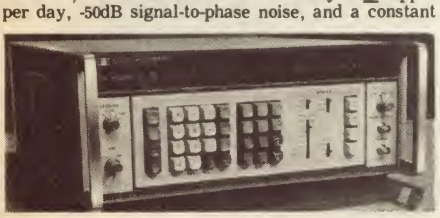
TRADE RELEASES . . . in brief

Clamp tester, Peak model C1300, is a versatile instrument for measuring voltage to 600V, current to 300A and resistance to 1k. The measurement scales are colour coded for ease of reading. The meter includes a reading hold facility. The suggested list price with case and leads is $36.50 including sales tax.

H. Rowe & Co Pty Ltd, PO Box 42, East Melbourne Vic 3002.

H-P Frequency Synthesisers

Frequency synthesisers, models 3330A and B, have built-in read-only-memories (ROMs) for control of all instrument operations. The ROM remembers the sweep parameters as programmed from the instrument keyboard. Manufactured by Hewlett-Packard, the instruments have a stability of ±.01ppm per day, -50dB signal-to-phase noise, and a constant



resolution of 0.1Hz up to 13MHz. Four-digit amplitude control to a resolution of .01dB over a 100dB range is standard on the model 3330B. The model 3330A has a manual control for amplitude, and output is levelled to ±0.5dB. Its amplitude range is about 0 to +13dB. Both instruments are programmable except for amplitude on the 3330A.

Hewlett- Packard Aust Pty Ltd, 22-26 Weir Street, Glen Iris, Vic 3146.

Thumbwheel switch, Plessey / EECo 8000 series, is supplied in kit form. The parts are assembled onto the user's printed wiring board, which incorporates the switching pattern as part of the overall printed design. Assembly is carried out in seconds without soldering or wiring leads. Expected applications include traffic control systems, modems, and industrial controls. The switches are less than 1in (25mm) high and less than 0.5in (12.5mm) wide. Six standard colours are available at no extra cost: black, red, yellow, green, blue and orange. Both sealed and unsealed versions are available.

Plessey Ducon Pty Ltd, PO Box 2, Villawood, NSW 2163.

Automatic bridge, model B900, is a wide-range AF bridge with two displays giving simultaneous automatic read-out of the resistive and reactive terms of any unknown. Manufactured by Wayne Kerr, UK, the bridge has an overall range from 10 micro-ohms to 100 gigohms in all four quadrants of the coupled plane. The displays each cover 0-19999 with automatic polarity, decimal and units indication. One reads C, L or 1 C; the other R or G in ohms or S. In addition, either or both displays can be used as 4-range DVMs.

Warburton Franki Pty Ltd, PO Box 162, Chatswood, NSW 2067.

Analog comparator, model 4050A, compares an unknown voltage with preset high and low limits, set independently by digital dials. HI-GO-LO lights are on the front panel. A relay, operating with the lights, may be used to actuate external sorting devices. A three-position analog voltage range switch on the rear panel sets the range to 0.1, 1.0 or 10V full scale. Polarity is selected by a switch inside the cabinet. Accuracy is ±0.6% of full scale with a response of 0.1s.

Hewlett-Packard Aust Pty Ltd, 22-26 Weir Street, Glen Iris, Vic 3146.

NEW RH (Radio House) RANGE OF MULTIMETERS

MODEL RH-60 $29.00 Packing & Postage $1.00

50,000 Ohms per Volt DC.
10,000 Ohms per Volt AC.
Specifications:
DC Volts: 0.25, 2.5, 10, 50, 250, 500, 1000.
AC Volts: 10, 50, 250, 500, 1000.
DC Current: 25uA, 5mA, 50mA, 500mA.
Resistance: 10K, 100K, 1M, 10M.
Decibels: —10 +62dB.
Accuracy: DC ±3 p.c., AC ±4 p.c. (of full scale).
Batteries: Two 1.5V dry cells. Overload protected.

MODEL RH-100 $39.75. Postage $1.00

100,000 Ohms per Volt DC 10,000 Ohms per Volt AC

• Overload protected by dual silicon diodes • Double-jewelled ± 2 per cent meter • ± 1 per cent temperature-stabilised film resistors • Polarity changeover switch • Mirror scale • Instructions for operation with circuit diagram.

SPECIFICATIONS:
DC Volts: 0.6, 3, 12, 60, 300, 600, 1200 (100,000/V).
AC Volts: 6, 30, 120, 300, 1200 (10,000/V).
DC Current: 12A, 300A, 6mA, 60mA, 600mA, 12 amps. AC Current 12 amps.
Resistance: 20K, 200K, 2M, 20M.
Decibels: —20 to +17, 31, 43, 51, 63.
Accuracy: DC ±3 per cent. AC ± 4 per cent (of full scale).
Batteries: Two 1.5V dry cells, size AA, "Eveready" 915.

"HANDYMAN" RH150 $11.50

CHECKED PACKED & POSTED $12.00

Pocket-size 3¼" x 4½" x 1¼". Instruction sheet and circuit.

SPECIFICATIONS:
DC Volts: 2.5, 10, 50, 250, 1000. 10,000 ohms per volt
AC Volts: 10, 50, 250, 500, 1000.
DC Current: .1, 25, 250mA.
Resistance: 20K and 2M.
Decibels: —20db, +62dB, 0.7KHz.
Capacitance: .0001, .01, .0025, .25uF

MODEL RH-20 $15.00 Packing & Postage 75c

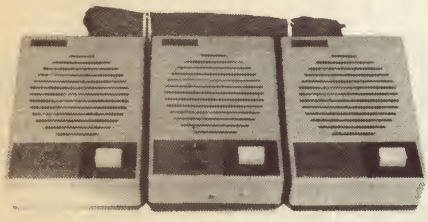
20,000 Ohms per Volt DC.
10,000 Ohms per Volt AC.
Specifications:
DC Volts: 0.25, 2.5, 10, 50, 250, 1000.
AC Volts: 10, 50, 250, 500, 1000.
DC Current, 50uA, 25mA, 250mA.
Resistance: 7K, 700K, 7M.
Decibels: —10, +22 (at AC/10V) + 20, +36 (at AC/50V). Upper frequency limit 7KHZ
Batteries: Two 1.5V dry cells.
With overload protection $18.00.

MODEL RH-80 $20.00 Packing & Postage 75c

20,000 Ohms per volt DC.
10,000 Ohms per volt AC.
Specifications:
DC Volts: 0.5, 2.5, 10, 50, 250, 500, 1000.
AC Volts: 10, 50, 250, 500, 1000.
DC Current: 50uA, 5mA, 50mA, 500mA.
Resistance: 5K, 50K, 500K, 5M.
Decibels: —10dB + 62dB.
Accuracy: DC 3pc.
AC 4 per cent (of full scale).
Batteries: Two 1.5V dry cells, size AA, "Eveready" 915.

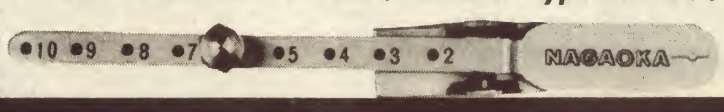
• Overload protected by dual silicon diodes • Double-jewelled ± 2 per cent meter • ±1 per cent temperature-stabilised film resistors • Mirror scale.

INTERCOMS



"Gem" 3-station $19.75
"Homer" 2-station $12.75
"Edison satellite" 2-station $9.75
Postage 75c

STYLUS PRESSURE GAUGE, Balance type NW-501



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RADIO HOUSE PTY. LTD.

306-308 PITT STREET 61-3832 26-2817 760 GEORGE STREET SYDNEY. 211-0171

Digital multimeter, model DMM50, is a five-digit instrument which offers high quality, high accuracy, high noise rejection, and high speed. Manufactured by Cimron, USA, the multimeter uses what the company calls SAINT logic. This is defined as a combined use of successive approximation (SA) logic for speed, and

integrating (INT) logic for its inherent noise rejection. Capabilities include: 5 range of DC and DC / DC ratio; 4 ranges of AC; 5 ranges of resistance; optionally coupled data output; and remote programming.

Warburton Franki Pty Ltd, PO Box 182, Chatswood, NSW 2067.

IF coils for the crystal locked HG receiver (published in "Electronics Australia", March, 1972) are available from Findlay Communications. Prices for 10 pairs or more is $1.60 per pair, plus 50c post & packing; for smaller lots the price is $2.20 per pair, plus 30c post & packing. Prices are subject to sales tax where applicable.

Findlay Communications Pty Ltd, 2 Pope Street, Ryde, NSW 2112.

Modular power supplies, 62000 series. The first 44 models in a new series of power supplies by Hewlett-Packard are available initially in 11 voltage ratings from 3 to 48V, with four output current ratings at each voltage, at up to 192W output. Each nominal output voltage is adjustable over a ±0.5V or ±5% range (whichever is greater) by means of a front-panel screwdriver control. Load and line regulation are both better than .01% or 1mV, whichever is greater. Ripple and noise is less than 1mV RMS, 2mV peak-to-peak, up to 20MHz. All supplies deliver full output to 50°C with derating to 71°C.

Hewlett-Packard Aust Pty Ltd, 22-26 Weir Street, Glen Iris, Vic 3146.

Communications receivers, 1000 series, have been designed on a modular basis by Eddystone Radio Ltd, UK, to cater for a wide variety of applications. The receivers are completely solid state and incorporate a number of advanced techniques to provide high performance and great reliability. Five models have beer announced initially, covering a wide range of applications for professional and amateur use. They are:

Model 1000. Basic model — a general purpose HF MF communications receiver.

Model 1001. Similar to model 1000, but with up to 10 crystal controlled channels.

Model 1002. High quality broadcast receiver covering HF and MF bands with AM and the VHF band with FM. Stereo reception is provided on the VHF band.

Model 1004. Maritime receiver, approved as reserve receiver for use on ships.

Model 1005. General purpose receiver to provide facsimile reception. Crystal controlled.

R. H. Cunningham Pty Ltd, Cnr Dryburgh & Victoria Streets, North Melbourne, Vic 3051.

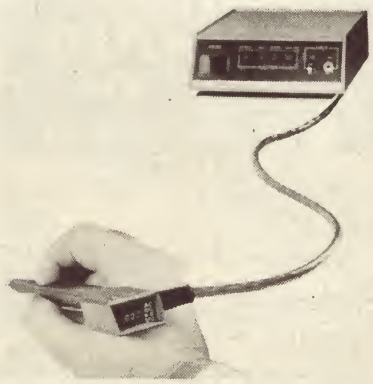
Gunn effect oscillator, type VSQ-9035, delivers a minimum of 75mW at 42GHz. The frequency trimmable device permits the design of sensitive parametric amplifiers without bulky, expensive power supplies. It features power stability of less than .01dB /°C and frequency stability of less than 1MHz /°C in any 10° range from 0° to 65°C. The source operates into a 1.3 maximum VSWR. Nominal input voltage is 12 to 28V DC regulated within +10% with 1.2A DC maximum input current.

Varian Techtron, Springvale Road, North Springvale, Vic 3171.

Microwave signal source, suitable for use in radar systems and broadcasting, has a continuously tunable frequency range of 400MHz to 1.2GHz. A mechanical digital read-out ensures rapid frequency setting and accurate resetability. Manufactured in the UK by the Sanders Division of Marconi Instruments Ltd, the instrument includes an IC power supply, square-wave generator and modulator drive circuit on a single printed wiring board with an edge connector for rapid servicing. Features include: frequency stablity .001% typical; power output 50mW min, 150mW max; output power can be adjusted at least 25dB with an internal PIN diode modulator; external AM can be applied through a front panel socket. A levelling amplifier and wide-band detector are optional extras.

Engineering Products Division, Amalgamated Wireless (A'sia) Ltd, 422 Lane Cove Road, North Ryde, NSW 2113.

Autoranging DVM, model 167, incorporates a complete digital display in a hand-held probe. With the probe display in hand, the user can measure a multitude of signals quickly and easily without having to constantly turn back to a front panel display. When required, the probe neatly stores in the front panel and the unit is used as a conventional digital multimeter.



Manufactured by Keithley Instruments, USA, the model 167 also features: 3½ digit LED display; automatic ranging; measures DC voltages from 1mV to 1kV, AC voltages from 1mV to 500V, and resistance from 1 ohm to 20M; optional AC and DC current ranges; battery operation with long battery life; full overload protection. The model 167 retails for around $375 duty paid, with discounts for quantity.

Warburton Franki Pty Ltd, PO Box 182 Chatswood, NSW 2067.

Operational amplifiers, types TAA 861 and TAA 865, with differential input and single-ended output, deliver a large output current (up to 70mA) and function even for very small supply voltages. Input current can be set by adjusting the externally connected DC load: for load resistances of 8 to 15k, the input current is less than 2mA. The maximum drive in the positive direction can be set externally to the exact value required.

Siemens Industries Ltd, 544 Church Street, Richmond, Vic 3121.

People in Industry

AWA REDIFFUSION PTY LTD has appointed Mr Roger Burton as chief engineer. Formerly with Rediffusion in the UK, he will head the closed-circuit television and television distribution activities of the company.

FAIRCHILD AUSTRALIA PTY LTD has appointed Mr Rod Perry as applications manager, computer systems division. He will be engaged in software development, custom system design, and specialised consultation work.

TUDOR RADIO

L. E. CHAPMAN ESTABLISHED 1940

103 ENMORE ROAD, ENMORE, NSW 2042.

PHONE 51 1011 NEW POSTAGE RATES PLEASE ADD EXTRA

Knobs long shaft, push on. Dozen **$1.20**
Knobs for concentric shaft. Dozen **$1.20**
250 mixed screws. BA, Whit., self-tapper bolts, nuts, etc. **$1** bag plus **25c** post.
Crystal microphones, good quality, ideal tape recorders, etc. **$2.80.**
Pick up shielded Wire **20 cents** yard.

POTS

1 meg. 2 pole switch	95c
100K switch 2 pole log	50c
10K carbon or wire wound	50c
1.5 linear	50c
½meg log	50c
250 Dual Ganged Log Pots	$1.25
20K switch	75c
10K switch	75c
1.5 dual ganged log	$1.00
2 meg Dual Ganged Lin.	$1.25
Dual 3 meg ganged log	$1.00
500 ohm WW	50c
50K Lin	50c
15K T5K	50c
10K Dual ganged concentric	50c
2 meg log 2 pol	$1.25
7,500 log	50c
200K lin	50c
250K log	50c
2K 1in slotted	25c
50ohm	50c
250K lin	50c
100K lin	50c
½meg lin	50c
50 log switch	75c
1 meg dual ganged log	$1.25
2 meg lin	50c
10K dual-concentric double-pole switch pots	$1.25
Mixed pots, 25 different values	$5.00

50-ohm POTS ideal for Ext. Speakers. **50c** each

POTS

1 meg. Dual Ganged Log	1.25
1 meg. Dual Ganged Lin	1.25
½ meg. Switch Pot double pole log	75c
Dual concentric double pole switch pot 50k, 25k	$1 each

Hitachi 2SB337 Power Diodes **$1.50**

Stereo Amplifier 3½ watt for Channel **$15**

Special perspex tops for record changers **$4.75**

Neon 240 volt bezel lights, **75 cents each**

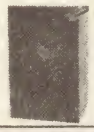
SPEAKER ENCLOSURE size 19 x 15 x 9 inches. Complete with two 8 x 4 speakers and 3-inch tweeter, including cross-over network, in 8 or 15-ohm **$25**

AMPLIFIERS, 3½ watts, size 7½ x 5 x 4½ **$10**

RECORD LEVEL INDICATOR METERS
$1.50

SPEAKER CABINET
size 16 x 8 x 10¼ inches complete with 8 tacx MSP dual cone speaker, 5 inch tweeter and crossover capacitor, **$21.50**
Cabinet without speakers **$10.00**

Speaker Cabinet 10 x 7 x 4 with 5 inch speaker **$5.50**



SPEAKER CABINET, size 19 x 15 x 9. Suit 12-inch and 3-inch tweeter. **$12.50**

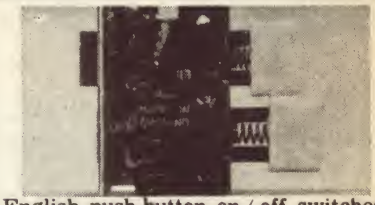
WE STOCK THE COMPLETE RANGE OF MSP SPEAKERS

SPEAKERS

MSP 8-inch dual-cone	$7.50
MSP 12-inch dual-cone	$9.50
MSP 7 x 5	$5.00
MSP dual-cone 6-inch	$7.50
Rola 6 x 4	$3.50
Rola 5 x 3, 15 or 27-ohm	$2.50
MSP 6 x 9, 8 or 15-ohm	$6.00
National hi-fi built in tweeter 8-ohm	$14.00
Peak dual-cone	$7.50
MSP 12-inch radial beam 12PQB	$25.00
Mid range 8 inch woofer 4-ohm	$6.00
MSP 5 / inch large magnet 15-ohm	$3.00
MSP 4 / inch large magnet 15-ohm	$3.00
Magnavox 6 x 9. 27-ohm	$5.00
MSP 6 x 4,8-ohm	$3.50
Rola 4-inch 27-ohm	$3.00
MSP 4¼ x 2¾ 8-ohm	$2.50
MSP 6 x 5 15-ohm	$2.00
Magnavox Tweeter 5-inch HF5SIC	$7.50
Rola custom speaker Kit C3 GX tweeter and C60 woofer and all components	$19.05
MSP 15-inch	$45.00
MSP dual-cone 12 aux 2 015-watt RMS	$17.50
Pioneer 15-inch 30-watt RMS	$40.00
Magnavox Electrostatic 3½-inch tweeter Md1 3.5	$2.50
Tesla 8-inch 4-ohm	$5.00
Rola 8-inch 15-ohm	$5.00
8-inch 3-ohm	$4.50
Magnavox 3TC tweeters	$4.00
Magnavox 8WR	
Magnavox 12WR	
Magnavox 8-30, 8-ohm	
MSP 6-inch 15 ohm	$4.00
MSP 5-inch tweeters	$3.50
MSP 2¼-inch	$2.50
MSP 2½-inch	$2.50
MSP 2¾-inch	$2.50
Speaker Plugs, 4 pin	15 cents
Speaker Sockets	15 cents

M.S.P. MODEL TWEETER SPEAKER. RANGE 5KHZ. NEW RELEASE $5.00.
2MBC RANGE 5HZ TO 20HZ $5.

MSP 12Aux, 20-Watt RMS 45-1200Hz **$17.50**



English push-button on / off switches, **75c** each. Pack and post **10c.**

B.S.R. 4 speed Gramo Motor and Pickup. 240 volt with built in 9 volt power supply **$7.95**

Push button switch, 4 position and 1 postoggle switch; **$1.**

Car radio push button tuner **$4.50**
Pack and post 30c, Interstate 60c.

ELECTROS: 3 in one

50uF	250VW	415VP
8uF	350VW	415VP
10uF	350VW	415VP

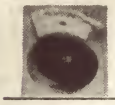
75 cents each.

Electros CHASSIS MOUNT. 100uF 350 WK 400 peak **75 cents**

BSR 4-speed Gramophone Motor and Pickup, Stereo **$19.00**

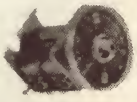
Curled expanding shielded wire approx. 7 yards **$1.50**
Miniature valve sockets 7 and 9 pin **15 cents** each.
Speaker Crossover network Condensers 2 MFD — **60 cents.**
Philips 1FT's 455KC **75c** each
Aerial and oscillator coils **50c** each

Transistor IFs, medium size, **75c** each



PHILIPS GRAMOPHONE MOTOR.
6 volts, 4-speed. and pick-up **$7.75.**

Speaker transformers 15,000 and 25,000 to 3 ohms 6 watts **$1.50** each
5,000 to 3 and 15 ohms **$1.25** each



SMALL 2 GANG TUNING CONDENSERS

Complete with direct drive scale **$1.75**

9-INCH PICTURE TUBES. General 9UPE **$20**

TV IF COILS, IDEAL FOR COIL FORMERS
$1 dozen

6.5mm jack plug & 7ft shielded cable **95c**

6.5 mm to 3.5mm plug adaptor & 7ft shielded cable **95c**

3.5mm to 3.5mm connector, 7ft shielded cable **95c**

Jack plug sockets, 6.5mm **35c**

METAL RECTIFIER, 150 watt, ¼ amp, **$1 each.**

TV aerial lead in **10c** yard
Tuning Condensers, 2-gang or 3-gang — **$1** each.

Portable record player cabinets, shop soiled. **$2.50** each

2 amp fuses **$3.50** per 100
Transistor plastic outer case, **50c** each
Stereo pick-up arms, with Xtal, **$6.00** ea.
Metal rectifiers for battery and electric portables **50c** each, post **10c**
Pilot lamp holders **60c** per doz.
100 Mixed Knobs including TV channel changers **$10.00**
3¼ amp fuses **$3.50** per 100
10 for **50c**

SPECIAL 25 ONLY
Stereogram, 6-valve, well known make, 5 watts RMS per channel **$27.50.**

AMPLIFIERS SOLID STATE
8 watts R.M.S. per Channel **$54.00**

Tape recorders portable MR 115 AC, DC Sanyo **$65.**

Morganite and IRC resistors. At least 33 values. Suit transistors, radios, TV etc., **$2.00** per 100. Pack and post. **25c.**
100 mixed condensers, micas, ceramics, tubular. Fresh stock. **$2.00.** Pack and post **25c.**
50 + 24, 350vw + 100uF 25vw, **75c** each
30 + 30 300VW 250VP **75c** each
Many others. Invaluable for service.

2meg. Lin Pots **50c**
RCA 7 INCH TAPE SPOOLS 50 cents

ELECTROS 20 MFD 200 P.V. 20c

PHILIPS PLUG-IN PICK-UP CARTRIDGE, mono **$3.50**

TEST PRODS 50 cents pair

STEREO JACK PLUGS 75 cents
Mono 50 cents
3:5 mil 25 cents

CASSETTES C 60 top brand **$1.20**

RECORD CHANGER: DUAL 12-10. Shielded motor **$58.00**

POWER TRANSFORMERS:
100-milliamp **$4.50**
300mA, 225V per side **$8.00**
50mA, 220V per side **$4.00**
Transistor type, 240V to 40V centre tapped, 6.3V
Transistor type, 240V to 150-CT-150, 6.3V 1A.

PILOT LIGHTS, Plug in **10 cents**

SWITCH WAFERS
20 cents each.

Vibrators, 6 volt sync **$3.50**
4-volt sync **$2.50**
24-volt sync **$2.50**
32-volt non sync. **$3.50**
Electros 500uF 10VW Vp12. **40c**

GENERAL TV CABINET, 9 inch, **$12**

RADIO KNOBS push on mixed, 12 for 50c

HEAT SINKS, size 4 x 2 **$1.00 each**

TRANSISTORS

2N1110	40c	AT492	50c
347OE	40c	AT430	50c
TN297A	40c	AT324	50c
AT337	40c	AT473	50c
AT322	40c	AT20	50c
AT420	40c	AC188	75c
AT323	40c	AT350	90c
AT347	40c	AD149	$1.50
AT410	50c	AC187	$1.75

BATTERY SAVER, 6 or 9 volt DC 300MA, **$11.00**

B.S.R. RECORD CHANGERS
latest models, G11301 balanced arm, shielded motor, heavy turntable, magnetic cartridge **$55**
C117 magnetic cartridge **$45**
UA15 with 12 inch turntable **$30**

TRANSISTOR EXTENSION CABINETS
Complete with 5-inch speaker and lead.
$3.50

DIODES:

OA79	40c
OA81	40c
HR15	50c
OA605	50c
IN295	50c
AD4002	50c
OA630	50c
EM484 silicon	75c
IN3492	$1.00

100 MIL power Transformer $6

600 ohm to 600 multi tap line output transformers $1

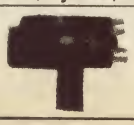
MIXED RESISTORS, 3.5 and 10W I.R.C., **25 for $2.**

DIAL DRUMS, 5 inch, 3½, 3 **50c ea.**

PHONE MICROPHONES
complete with 3ft 8inch shielded lead and 3.5MM jack plug

CABLE, 9 STRAND, including 1 shield and OCTAL PLUG LENGTH, 6 yards, **$2**

B.S.R. CERAMIC CARTRIDGE STEREO $5



POWER TRANSFORMER
300 mA voltage doubler 220 — 260V primary 100v secondary 6.3V and 5v heater windings **$8.**

Transistor miniature speaker transformers **50c** each
Transistor speaker transformers 3.85 to 3.50 C.T. **$1.00**
Portable TV car Cradle **$4.00**
Portable TV Aerials **$4.50**

TRANSISTOR EAR PLUGS complete with plug lead and pouch **95 cents**

STEREO GRAMOPHONE, motor and pick-up, 4 speed **$12.50**

PICTURE TUBES
New 9 inch **$19**
12 inch **$25**

B.S.R. MINI CHANGER
UA50 $19.50.

6 VOLT PILOT LIGHT, screw in **ea. 15c.**

RESIN CORE SOLDER 5 yards 75c

INDOOR TV AERIALS $1. 50. Pack and Post 25c

Electros 20 400-450
Electros 10 400-450 **75c each**
Electros 15 50-65

ALLIGATOR CLIPS
on 16inch lead **20** cents a pair

SATO BRACKET LAMP
25 cents

STEREO SPEAKER LEAD, 10 cents yd.

50 M CHOKE $1.
Pack and Post 30 cents,
Interstate 60 cents.
300M Choke $2.50.

TESLA 4 SPEED
Gramophone motor and pick-up 4-pole motor, balanced arm **$25.**

SPECIAL
25 different values. Mixed pots for **$5**

BELLWIRE 2c yard

Transistor ear plugs 3 for **$1.00**
Tag strips, mixed types Dozen, **60c**
Switches, Oak 4-position **50c** each
2-position **40c** each

3¼ AMP. FUSES $3.50 100.

Din Plugs, 3 or 5 pin 50c each.

TV legs, set of 4 **$1.** Size 5¼ inch. **$1.00**
10K Double pole concentric pots $1.25
Electros 8MFD VW VP 300 350 4 for $1

DISCATRON CABINETS $4 EACH.

NEW RANGE OF RESISTORS CONDENSERS AND POTENTIOMETERS

CARBON RESISTORS

Current type resistors by Philips, IRC, Ducon & Morganite in a wide range of values from 100 ohms to 10 meg. ½ and 1 watt
$1.50 per 100 Post 30c Extra

MIXED CONDENSERS

The condensers are in most popular brands and include polyester, paper, mica ceramic and electrolytic on values to 8mfd.
$1.50 per 100 **Post 50c extra**

CERAMIC CONDENSERS & THERMISTORS

A large range of current disc & tube ceramic condensers & thermistors.
$1.50 per 100 **Post 30c extra**

POTENTIOMETERS

The pots are all current types and include switch pots, standard pots, pre-set etc.
$1.50 per doz. **Post 50c extra**

REGRET SPECIAL VALUES IN RESISTORS, POTS, & CONDENSERS CANNOT BE SUPPLIED.

NEW BATTERY OPERATED BURGLAR OR DOOR ALARMS AT HALF PRICE

These alarms operate on two 1½v batteries which are supplied and are suitable for mounting on doors, windows, drawers etc and give a very loud signal when set off.
$1.95 Post 25c

At last a breakthrough in the cost for high quality portable radio transceivers of the walkie-talkie hand-held type. We are introducing and offering for sale a fully PMG approved
MIDLAND 1 WATT TRANSCEIVER
for 27,240 or 27,880KHz (specify which frequency required; operation with switch provision for two additional channels, tone call signal, background noise squelch control, battery voltage indicator, steel case with separate cover, good for five miles distance communication under average field conditions, with penlite cell-batteries for
ONLY $39.95 PER UNIT, FULLY GUARANTEED.

MAGNAVOX WIDE RANGE TWIN CONE SPEAKERS

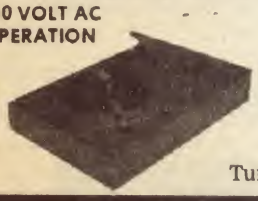
8 on 16 ohms VC. Post and packing 65c

6WR MK V 12 Watts RMS **$9.90**
8WR MK V16 Watts RMS **$10.75**
10WR MK V 16 Watts RMS **$11.50**
12WR MK V 16 Watts RMS **$12.50**
8-30. 30 Watts RMS **$18.50**
3TC Tweeters **$3.75**

SPEAKER SPECIAL
Imported Tesla 8" Speakers. 8 ohm imp. **$4.75.** Post and Packing **65c.**

NEW IMPORTED STEREO TURNTABLE AND PICK-UP

240 VOLT AC OPERATION



3 speed turntable with ceramic stereo pickup counter-balanced tubular arm, **$7.90.** Base in teak or walnut, **$6.50** extra. De luxe base **$8.50** Post 50c or $1.00 with base.

Turntable and motor separate **$4.50**

21 WATT P. A. AMPLIFIER — MIXER

As featured in June issue **Electronics-Aust.**

complete kit of parts.
$57.00 **Post Extra**

Wired & Tested $10.00 extra

NEW COLUMN SPEAKERS

Suitable for above Amplifier in walnut finished cabinet containing four 8" Rola Speakers Imp. 8 ohms.
$37.50 **REGRET NO MAIL ORDERS**

NEW GARRARD RECORD CHANGERS MODEL 1205

4-speed manual or automatic operation fitted with Garrard Crystal Pick-up. **$25.00**
Post & Packing **$2.50** extra (Reg. Post)

LEADER SIGNAL GENERATOR LSG11

240V A.C. operated, 6 band 120KC to 390 Megs. Provision for crystal **$49.50**
Post NSW, 75c; Interstate, **$1.25.**

A TRANSISTOR PREAMP FOR MAGNETIC PICKUP OR TAPE HEAD (Stereo)

Using 2 transistors per channel, as featured in "Electronics Australia" (Sept. 1971). Complete kit includes transistors, PC board, resistors, capacitors.
Circuit and full details supplied.
Kit (not incl. box) **$7.90**
240V Power Supply **$4.50**
Metal box **$2.00** extra.
State if required for pickup or tape head.

NEW LOW COST STEREO SYSTEM

AS FEATURED IN JAN. ELECTRONICS AUSTRALIA

Complete kit of parts including "Garrard" record player with auto. stop and crystal pick-up. Magnavox 8WR or 6WR wide range twin coned speakers. (Cabinets not supplied). Amplifier only, less speakers and player. **$32.00**
$69.50 Post and packing $2.50 extra.

POLYESTER CAPACITORS

Pack of 100 new polyester capacitors .001 to 0.1 in 160, 250 and 400 volts working. **$3.50** Plus 50c Post and Packing

BROADCAST TUNER KIT

$22.50
Post 75c

Complete kit of parts including dial mechanism and zener diode for this I.C. tuner as featured in Feb. 71 E.A.

NATIONAL RADIO SUPPLIES

332 Parramatta Road, Stanmore, NSW 2048 Phone 56 7398

AMATEUR BAND NEWS AND NOTES

by Pierce Healy, VK2APQ

Fifteenth Jamboree-on-the Air

This unique event which, for the last fifteen years, has provided, by means of amateur radio, communication links for Scout groups throughout the world, will be held on 21st & 22nd October 1972.

During the 15th Jamboree-on-the-Air radio communication facilities will be provided by amateurs to Boy Scout and Girl Guide groups throughout the world. Scouts and Guides will be able to exchange greetings with groups of their own nationality as well as those in other countries. As in the past, the event will provide an interesting weekend for both amateurs and members of the world wide scouting organisation.

The J-O-T-A is not a contest; there are no prizes to be won. Rather it is an opportunity for amateurs to provide a service to the young people of their community and enable them to send messages of goodwill to other Scout groups, whether in their own country, in towns or cities of foreign countries, or some remote village of a sparsely populated area.

Participation certificates, designed by a Portuguese Scout, will be issued to all those taking part.

Last year's experiment in starting and finishing at midnight local time will be tried again this year. Starting time will be 0001 hours local time, Saturday 21st October, 1972 and finishing time at 2359 hours local time, Sunday 22nd October 1972.

An amateur may invite Scout or Girl Guide groups to visit his station at suitable times during the weekend. Or, he may arrange to operate portable from a Scout hall or camp site at convenient times. The use of SSB transceivers makes the latter method rather simple. It will be found that Scouts are able and willing to erect aerials quite well from all kinds of anchoring points. Rules for the event are very simple:

(a) Any authorised amateur frequency may be used.
(b) Observe national licensing regulations.
(c) Advise the local branch organiser of intention to participate.
(d) Send in a report of activities during the weekend to the branch organiser.

The latter two apply to the senior member of the Scout group participating. The licensee of the station should advise those participating of the requirements under item (b).

In Australia persons are allowed to speak over amateur stations under the personal supervision of the licensed operator. This is not normally allowed in many countries but, due to the nature of the Jamboree-on-the-Air, several administrations waive the restriction for this event.

In a letter to Noel Lynch, national organiser in Australia, Ross Hohnen, international commissioner, suggested that some thought be given to developing International Brotherhood with Scouts in many of the island groups throughout the South Pacific. Ross proposed that efforts be made to contact as many as possible of the following island groups:

Micronesia:

Marianas	Marshall
Caroline	Gilbert
Nauru	Ellice

Melanesia:

New Guinea	New Caledonia
Solomon Islands	Loyalty
New Hebrides	Fiji

Polynesia:

Samoa	Cook
Tongan	Society Islands
Tuamotu	Papeete
Marquesas	

The following have been appointed branch organisers for the 1972 J-O-T-A:—

Papua / New Guinea:
Geoff Perkins
C / o Radio Branch
Dept of Posts and Telegraphs
Port Moresby, Papua.

Queensland:
Branch H.Q. Commissioner Ian Clarke
C / o Queensland Branch Headquarters
Box 50, PO Broadway, Qld 4000.

New South Wales:
Branch H.Q. Commissioner Ray Lawrence
C / o NSW Branch H.Q.
265 George Street, Sydney, NSW 2000.

Victoria:
Les Marmo
50 Howitt Street
South Yarra, Vic 3141.

Tasmania:
G S M Ray Jeffrey
8 McRobie Road
South Hobart, Tasmania 7000.

South Australia:
John Hardy
23 Colonial Square, Robert Street,
Glenelg South, SA 5045.

West Australia:
Commissioner Peter Hughes
58 Preston Street,
Como WA 6152

A report, prepared by Noel Lynch, indicates the popularity of the event. The figures are based on reports of Australian participation in the 1971 J-O-T-A.

Amateur stations	437
Scouts and Scouters	8098
Guides and Guiders	2197
Scout Groups and Districts	696
Guide Companies	198
Contacts between Australian stations	4704
Overseas contacts	1164

These figures would be enhanced if reports had been received from all groups known to have participated.

Amateurs able to make their stations available during the event are invited to contact one of the Scout or Guide groups in their area. Alternatively they may contact the Branch organiser in their State for information regarding groups wishing to participate. Leaders of Scout or Guide groups should enquire from amateurs in their area.

WIRELESS INSTITUTE ACTIVITIES

The office of the WIA Federal Executive is now located at:

474 Toorak Road
Toorak, Melbourne

Postal address:
PO Box 150
Toorak 3142
Victoria.

For several years the office was located at the Victorian Division Headquarters 478 Parade, East Melbourne.

UNIQUE REUNION

On Sunday 14th May, 1972, there was a reunion at Springwood, New South Wales, of a group of amateurs who were members of the WIA Federal Executive in 1935. Many memories were recalled of the "state-of-the-art" as it was 37 years ago, and the problems that confronted amateur radio and the WIA in those days.

It may be news to many present day members of the Institute to learn that the Federal Executive of the WIA was in past years provided by members of the New South Wales Division. Also, that two of those present at the reunion attended the inaugural meeting of the NSW Division VHF Group in June 1939.

It is unfortunate that past work is often overlooked and the identity of members who served the Institute in the past are not known to many of today's members. The photograph taken at the reunion shows that youthfulness has naturally diminished over the past 37 years. But that cannot be said of their enthusiasm for amateur radio; all are active operators.

Members of WIA Federal Executive, 1935, L to R Bill Moore, VK2HZ, Federal President; Harry Caldecott, VK2DA, Federal Secretary; Ron Cohen, VK2TF; Eric Collier, VK2BEL (then VK2EL); Morrie Meyers, VK2VN; Peter Adams, VK2JX.

NEW SOUTH WALES
South West Zone Convention

The 20th South-west Zone convention, NSW Division, WIA, will be held at Tumbarumba on the holiday weekend September 30th, October 1st and 2nd 1972. The convention is being organised by the Tumbarumba District Radio Club assisted by members of the Khancoban Radio Club.

Highlights of the convention will be:—

Registration and refreshments on arrival.

Saturday 30th:

9.30am-4.00pm HF and VHF scramble for mobile operators enroute to Tumbarumba.

Radio clubs and other organisations, as well as individual amateur operators, are cordially invited to submit news and notes of their activities for inclusion in these columns. Photographs will be published when of sufficient general interest, and where space permits. All material should be sent direct to Pierce Healy at 69 Taylor Street, Bankstown, NSW 2200.

Glider joy rides, tours of Tumbarumba, fishing contest for the children. Bait supplied. Bring your own rods.
7.30 pm Official opening and Dinner.

Sunday 1st:
Commencing 9.30 am Cipher Scramble, a slightly different mobile event on 144MHz.
Special events for ladies.
WIA news broadcast.
Trade displays
Disposals sale.
12.00-1.00 pm Barbeque lunch.
1.00 pm 144MHz transmitter and treasure hunt, a two hour event for the whole family.
An HF transmitter hunt.
Prize giving and farewells.
Barbecue tea for those staying overnight.
Evening: Films of the Snowy Mountains.

Monday 2nd:
Tour to Khancoban for a comprehensive inspection of Murray 1 and 2 Power Stations and Central Control Centre.
Depart Khancoban for Sydney via Thredbo, approximately 380 miles or Melbourne via Corryong 286 miles.

Registration fee: $2.00; Dinner $2.50 per adult, children under 16 years free. The Sunday mid-day barbecue will be organised by the local Boy Scout Group. Proceeds will go directly to that group.
Venue: Tumbarumba Show Ground. The dinner will be held in the Pioneer Hall at the Show Ground.

Accommodation available is limited to one twenty bed motel, two hotels, and a caravan park. No overnight caravans are available at the park. Motel bookings close on 16th September.

Bookings for accommodation should be sent to J.M. Clode, VK2EZ, "Allawah", Ournie, NSW, 2640, or telephone STD 060 374134.

Central Coast Amateur Radio Club

The repeater at the Central Coast Radio Club rooms, Dandaloo Street, Kariong, just south of Gosford (channel 1 146.1MHz in, 145.6MNz out) is building up an encouraging record in performance and coverage. Divisional broadcasts on Sunday mornings and evenings are being radiated through the system with excellent results.

Plans are also in hand to conduct coverage tests to find the extent of shadow areas in the primary service area.

Working bees have painted a substantial part of the exterior of the club rooms and constructed a most impressive water tank stand. Recently a clinic was conducted by Peter Campbell, VK2AXJ and Ross Mudie, VK2ZRQ for 144MHz mobile units. Many of those attending were surprised to find how much better their units performed after receiving the "treatment".

Meetings are held at the club rooms every third Friday of the month. Visitors welcome.

Full details may be obtained from the Secretary, Dick Maitland VK2BBK, P.O. Box 238, Gosford, NSW 2251.

VHF and TV Group

The July, 1972 issue of "6UP", newsletter of the NSW VHF-TV group, announced that the PMG's Department has given approval for unattended six and two meter beacon transmitters to be installed at the NSW divisional transmitting station Quarry Road, Dural, north-west of Sydney. Indications were that a 15 watt transmitter on 52.45MHz would be in operation by August, 1972.

The beacon will be identified by the call sign VK2-WI/R at 30 second intervals at 7wpm, mode A2 (MCW). An increases in power will be made later.

The 144MHz beacon will not be installed until the new 150 foot tower is erected for the Sydney repeater. It was also reported that negotiations were under way for setting up a 432MHz beacon.

The VHF & TV Group meets on the first Friday of each month at the Wireless Insititute Centre, 14 Atcheson Street, Crows Nest, close to St Leonards railway station. Visitors welcome.

Details of the group's activities may be obtained from the secretary at the above address.

Canberra Radio Society

The annual general meeting of the Canberra Radio Society will be held on Friday night 20th October, 1972. The meeting will be held in the Civil Defence Room, Griffin Centre, Bunda Street, Civic at 8.00 pm.

An agenda item proposed for submission at the meeting is:

Inaugaration of the VK1 Division at the next WIA federal convention.

There are now more than 120 amateurs in the ACT (VK1 call area). About half are members of the WIA. This figure should more than qualify for WIA division status. Informed sources believe that with the formation of a division there will be a substantial increase in WIA membership in the area.

The construction of the Canberra Radio Society's 144MHz beacon is well under way. The antenna has already been erected on top of the MLC building. The call sign VK1VF has been requested. The licence or call sign has not yet been approved by the Radio Branch, but technical details have been submitted as requested.

Under the title "The Repeater" the society publishes a three sheet news bulletin covering many items of interest.

The QSL officer of the CRS has over three hundred QSL cards confirming contacts with call signs not yet issued in the VK1 call area. Those "pirate" operators wishing to collect their cards may do so by sending a stamped self addressed envelope to the QSL Officer, Canberra Radio Society, Box 1173 P.O. Canberra City, ACT 2601.

VICTORIA

Geelong Radio & Electronics Society

The annual general meeting of the Geelong Radio and Electronics Society was held on June 22, 1972. The following officers were elected—
President: Will Chandler VK3ZSN
Vice-president: Harry Michael VK3ASI
Secretary: Ivan Kennedy VK3BAZ
Treasurer: Bill Erwin VK3WE
Assist. Sec./Treas. Max Hepner VK3BAX
Committee members:
Rod GreenVK3AYQ
Bill Knight VK3ZLC
Keith Uriens VK3AFI
Reg Ball —
Bill Bond —
Catering Officer: Fred Whillance —
PR Officer: George Wilson —
Assis. PR Officer: David Farqharson —

Anyone residing in Geelong or visiting the area is invited to attend the Society meetings held every Thursday night at 7.45 pm. Meetings are held in the club rooms, Breakwater Road, Belmont.

Further information may be obtained from the secretary Ivan Kennedy, VK3BAZ, 15 Cook Street, Newtown, 3220 Victoria.

Geelong Amateur Radio & TV Club

As these notes were being prepared members of the Geelong Amateur Radio and Telvision Club were discussing several matters relating to future activities at the club. These included the annual dinner, the channel 4, Geelong repeater installation and the introduction of a slow scan television project. Members were also awaiting the delivery of an FT 200 transceiver and a 14AVQ antenna for the club station.

General meetings are held on the first Friday of each month at the club rooms, Storrer Street, East Geelong. Working bees are generally held each Saturday afternoon and study classes every Friday night at 7.30 pm.

Further details from the secretary, Geelong Amateur Radio & TV Club, P.O. Box 520, Geelong, Vic 3220.

WIA YOUTH RADIO SCHEME

The Institution of Radio and Electronics Engineers awards pennants each year to the two most successful YRS clubs, and these are eagerly contested. The pennants for 1971 have been awarded to the Maitland Radio Club, as the most progressive non-school club, and the Macquarie Boys High School, Rydalmere, as the foremost school club.

An indication of YRCS progress in NSW is given by the figures for certificates issued:

Grade	1970	1971
Elementary Certificate	174	181
Junior Certificate	55	88
Intermediate Certificate	4	35

There was also one Radio Instructor's Grade 2 certificate issued. Making a total of 305 certificates issued in 1971.

Maitland Radio Club

Of the eighteen candidates from the Maitland Radio Club who sat for YRS examinations early in July 1972, 12 gained honours, one a credit and five a pass. They were:

Elementary radio certificate, Honours: G. Buxton, P. Barr, D. Archer, K. Leayr, M. Rathbourne, M. Robertson, C. Pillage, C. Duggan, M. Piper, T. Farley, C. Spooner. Credit: W. Drain. Pass: P. Weston, J. Pitts.

Junior Radio Certificate, Honours: M Smith, Pass: A. Watson, W. Hooke, W. Vasella.

Three members gained their Senior Radio Certificates. They were, John Gibson, honours; Gary Watson and Phillip Lawrence, credit.

The examinations were supervised by Mr C. G. Cooke and conducted at the club's headquarters in Maize Street, Tenambit, East Maitland.

The club theatrette will, when possible, be made available to other clubs for film evenings etc. Further details of this facility may be obtained from the secretary, PO Box 54, East Maitland 2323 or Maitland telephone 33 7286.

Westlakes Radio Club

Members of the Westlakes Radio Club who were successful in recent YRCS examinations are:
Elemenatary Certificate; Honours: T. Baumfield. Credit: M. Caldwell, R. Hallinan, P. Partridge, I. Porteous, P. Rutledge. Pass: S. Bates, J. Bromell, M. Blackmore, G. Richter.
Junior Certificate, Credit: S. Hallinan, C. Marshall, K. Rugg. Pass: G. Baguley, S. Kelly, S. Regan.
Intermediate Certificate, Honours: D. Crofts, E. Keim. Credit: P. Lorger. Pass: A. Cameron.

A regular feature of the Westlakes Radio Club is their film nights. A varied program of documentary, travel and technical films is screened followed by supper. These evenings are held on the fourth Wednesday of each month commencing at 8.15pm following the AOCP class.

Details of club activities may be obtained from the secretary, Eric Brockbank, VK2ZOP, PO Box 1, Teralba, NSW 2284.

YRCS Supervisors' Conference

During the last 12 months Reverend Bob Guthberlet, WIA federal YRCS co-ordinator, and Jack Flynn, acting secretary, have been trying to organise a definite date for a YRCS state supervisors' conference. Originally the conference was set down for May 1972 as reported in the March and May issue of these notes. However, as the result of discussions at the WIA federal convention last Easter the conference was deferred to allow certain anomalies in relation to the scheme in Victoria to be clarified.

Dating back to 1968, the YRCS has not been recognised as an integral part of the Victorian Division activities. The scheme as organised in Victoria is only affiliated as a member club of the WIA and as such does not come under the direct control of the council of the Victorian Division.

Reverend Bob Guthberlet, WIA federal Youth Radio Scheme co-ordinator.

In a letter received from Bob Guthberlet, towards the end of July, he stated that he had received advice from Federal Executive WIA, that they would host a conference in Melbourne on 2nd and 3rd September, 1972. And he had invited the WIA federal president, Michael Owen, to chair the conference.

Leaders of Youth Radio Clubs from Whyalla, Port Augusta and Port Pirie travelled to Adelaide on Saturday 17th June, 1972 to meet representatives of metropolitan Youth Radio Clubs at the Annual General meeting of the YRCS in South Australia. In attendance at the meeting were the WIA federal co-ordinator Reverend Bob Guthberlet and the WIA South Australian division president, Geoff Taylor.

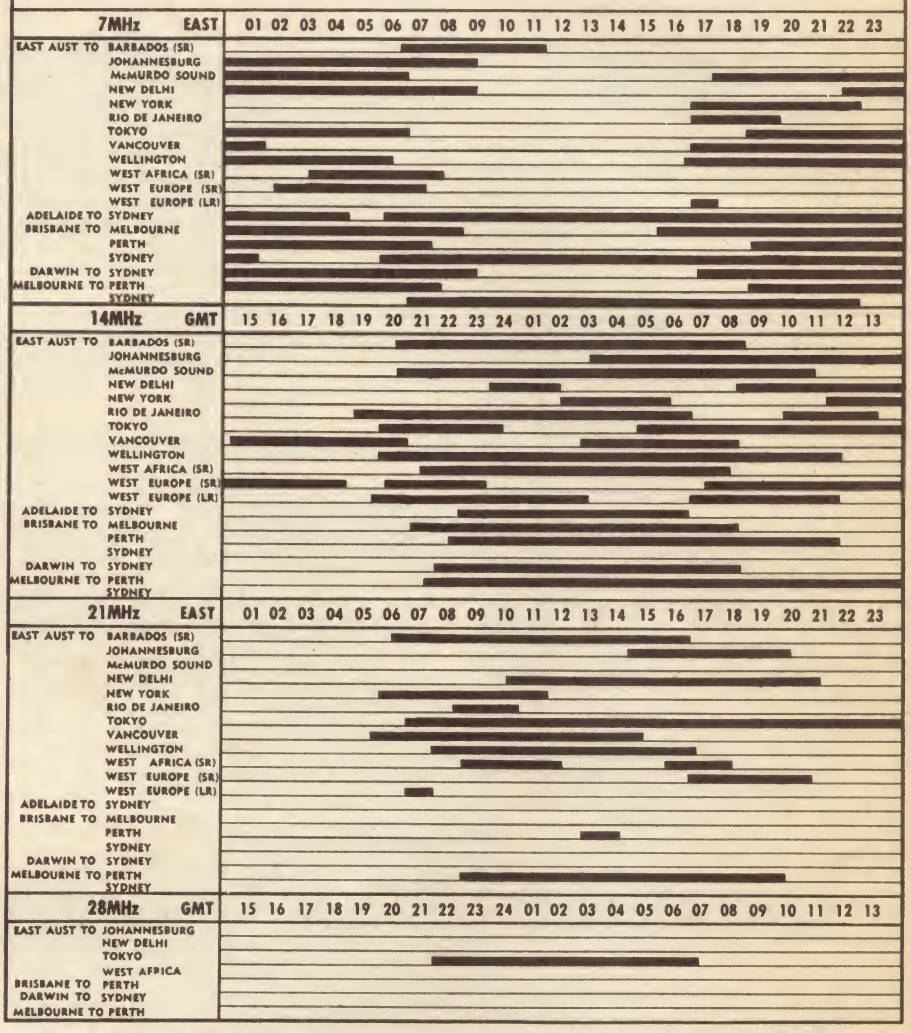
The meeting place was kindly made available by Prince Alfred College which has a strong YRS club. Club leader, Mr Phil Emery, who is also a teacher at the college, showed those attending some of the facilities they have available. During the meeting some of the visiting club leaders demonstrated project kits and teaching aids and a worthwhile exchange of ideas took place. The YRCS committee was asked to investigate the use of standard project kits and further develop this aspect of club practical work.

Publicity brochures have been distributed to those taking part in a crystal set competition conducted by a local radio station. This has resulted in a stream of enquiries from would-be YRCS members.

The following Elementary certificates have been awarded to successful candidates: Whyalla Radio Club: Honours — S. Baker. Credit — M. Dalby; T. Bergin; Norbett Kroll. Pass — G. Wood G. Whitford. Elizabeth Radio Club: Credit — J. Neaf; A. Banks. Pass — P. Routledge.

IONOSPHERIC PREDICTIONS FOR SEPTEMBER

Reproduced below are radio propagation graphs based on information supplied by the Ionospheric Prediction Service Division of the Commonwealth Bureau of Meteorology. The graphs are based on the limits set by the MUF (Maximum Usable Frequency) and the ALF (Absorption Limiting Frequency). They have been prepared for the four most popular amateur bands over a number of interstate and international circuits. Black bands indicate periods when circuit is open.



NEW ZEALAND AWARD

CHRISTCHURCH AWARD: To celebrate the Commonwealth Games in Christchurch during January and February 1974 the award will be issued to amateur stations who conduct a two-way contact with stations in the following call areas, and comply with the following requirements.

Contacts with New Zealand stations using the special "ZM" prefix. Z1; ZM2; ZM4 one contact. ZM3 two contacts one being with a station located in Christchurch. One contact with a station in each of the Commonwealth countries. Region 1 — e.g. G's; Region 2 — e.g. VE's; Region 3 VK and Pacific Islands.

Send a certified copy of log book entries and 4 IRC's to Awards Manager, P.O. Box 1733, Christchurch, NZ.

All contacts must be made between 3rd June, 1972 and 2nd February, 1974.

TELECOMMUNICATION JOURNAL

The July 1972 issue of the Telecommunication Journal, monthly review of the International Telecommunication Union, contains several articles of interest to both amateurs and readers in general.

Separate editions are published in English, French and Spanish. Subscriptions, by surface mail: 5.00 Swiss francs copy.

The Journal may be obtained from the Sales Division, International Telecommunication Union, Place des Nations, 1211 Geneva 20 Switxerland.

TECHNICAL BOOKS AND PUBLICATIONS

Semiconductor text

SOLID-STATE ELECTRONICS CONCEPTS, by John I. Matthews. Published by McGraw-Hill Book Co, New York, 1972. Hard covers, 195 x 242mm, 406pp, many illustrations. Price in Australia $9.40.

A book written as a text for a one-semester introductory engineering course on semiconductors and their applications. It is divided into two parts, the first of which (four chapters) provides background by giving a review of basic DC and AC circuit theory, and instrumentation concepts. The second and larger part (10 chapters) then presents basic concepts of semiconductor device operation, and primary design considerations.

Experimental circuits are given to enable the student to explore many of the concepts for himself. Each chapter begins with a statement of objectives, and concludes with a summary, a glossary, reference list and tutorial questions. The answers to odd-numbered questions are given at the back of the book.

The book is concise and easily read, and is well illustrated. It does not go as deeply into basic solid state concepts as I would like, and I find its description of basic bipolar transistor operation quite poor. However its readability and tutorial orientation could make it a good choice for an introductory course for undergraduates or trainee technicians, if supplemented by suitable lecture material.

The review copy came from the local office of the publisher, but major bookstores should have stocks by the time this review is published. (J.R.)

SCR Manual updated

GE SCR MANUAL, 5th edition, edited by D. R. Grafham and J. C. Hey. Published by the Semiconductor Products Department, General Electric Company, Syracuse, New York, 1972. Soft covers, 138 x 215mm, 687pp, many illustrations. Price in Australia $4.00, plus 40c postage.

The publication of this fifth edition of GE's very well-known SCR manual has a special significance for them: it marks the 15th anniversary of their development of the first commercial SCR device. General Electric are justifiably proud of the contribution which the SCR has made to modern electronics and power engineering in that 15 years.

The SCR manual has been completely revised by a new set of contributors for this edition, but although much detailed revision and updating has taken place, it still uses the same format as before. For those familiar with earlier editions it therefore has a familiar look and feel, and often-used sections can be found in much the same place.

Even more so than with previous editions, it provides a very thorough and up-to-date treatise on modern design practice using SCRs, Triacs and other thyristor devices. It is an invaluable reference for all who work with these devices, and outstanding value at the price.

The review copy came from Australian General Electric Pty Ltd, who advise that like other GE publications it is available from AGE offices and also from their distributors. (J.R.)

Amateur callbook

NZART AMATEUR RADIO CALLBOOK 1972, edited by D. J. Mackay. Published by the New Zealand Association of Radio Transmitters, Inc Soft covers, 185 x 241mm, 112pp, some diagrams. Included in subscriptions to "Break-In".

The latest edition of this widely-known and well produced annual call book. It gives not only the basic listings of the call signs, names and addresses of NZ amateurs, but a wealth of information besides: broadcasting and television stations, frequency allocations for the various services, standard frequency stations and their schedules, beacon and repeater locations and frequencies, ionospheric prediction information, and of course much information about the NZART and its services. This includes a full directory of its various branches.

For the radio amateur or short-wave listener interested in working up more NZ contacts, or perhaps planning a visit to the country, a most valuable handbook.

The review copy came direct from the publishers. (J.R.)

Introduction to ICs

ABCs OF INTEGRATED CIRCUITS, by Rufus P. Turner, PhD. Published by W. Foulsham & Co Ltd, Slough, Bucks, England, 1971. Hard covers, 140mm x 225mm, 96pp, over 60 illustrations. Price in Australia, $4.25.

This is an introduction to the IC, its construction, behaviour and uses. The approach is descriptive and practical, with theory and mathematics purposely kept to a minimum. No space is given to basic semiconductor theory: the reader is assumed to be familiar with N and P type materials, and with common semiconductor devices.

The book is divided into seven chapters: 1 — Fundamentals of the Integrated Circuit; 2 — Amplifiers; 3 — Oscillators; 4 — Controls; 5 — Communications; 6 — Test Instruments; 7 — Supplementary Applications. There is also a special introductory chapter for the English reader and an apendix listing US manufacturers of ICs used in circuits in the book.

Most of the ICs used in the circuits are manufactured by companies with subsidiaries in this country, so little difficulty should present itself on obtaining ICs for experimenting. Students, hobbyists and others with some knowledge of electronics should find this quite a useful introduction to integrated circuits.

The review copy was supplied by Grenville Publications Pty Ltd. (J.H.)

Operational amplifiers

THE VERSATILE OP AMP, by Michael Kahn. Published by Holt, Rinehart and Winston, New York, 1970. Hard covers, 155mm x 235mm, 240pp, many diagrams. Price in Australia, $11.10.

This text, describing the fundamentals and applications of the operational amplifier, is intended for high school or technical college students familiar with intermediate algebra and trigonometry, and with the fundamentals of DC and AC circuit analysis. Basic concepts pertinent to all amplifiers are covered, but are applied specifically to an amplifier manufactured in a single package.

The book contains nine chapters: The Amplifier; The Black Box; The Practical Op Amp; The Noninverting Amplifier; The Inverting Amplifer; DC Offset and Drift; Frequency Response; Oscillation and Phase Compensation; Applications.

Problems for the student are given with the first eight chapters— selected answers are given at the back of the book. A short list of references and a list of terms are also included.

This is a well-written book which should be easily understood by its intended readers. It should also be of interest to technicians and others who are encountering op amps for the first time.

The review copy was supplied by Holt, Rinehart & Winston (Aust) Pty Ltd. (J.H.)

LITERATURE — In brief

DC POWER SUUPPLY HANDBOOK (Application Note 90A) is now available free from Hewlett-Packard A'sia Ltd, 22-26 Weir St, Glen Iris, Vic 3146. Because of the long delay in obtaining this note, caused by the US shipping strike, previous records of requests for this publication are no longer held by Hewlett-Packard, and fresh application should be made, on company letterhead marked "Attention: Marketing Communications Dept".

Also available from the company are:
The No Nonsense Guide to Oscilloscope Selection.
Hewlett-Packard Journal, April, 1972 and May, 1972.
Measurement News, March / April, 1972.

FR ELECTRONICS REED SWITCH CATALOGUE, latest edition, is now available from NS Electronics Pty Ltd, Cnr Stud Rd and Mountain Hwy, Bayswater, Vic. 3153. In addition to details of the complete range of 37 reed switches, there is general information on the use of reed switches and a fold-out specification sheet and applications list for use as a wall chart.

COAXIAL COMPONENTS, a guide to components and accessories for frequencies from HF to 9GHz made by General Radio, USA, is available free from Warburton Franki, Box 182, Chatswood, NSW or interestate offices. Included are detailed specifications for general purpose and precision 50-ohm and 75-ohm connectors, adaptors, attenuators, terminations, two-and three-port coupling elements, cables, airlines and broad band directional couplers.

TECHNICAL LIBRARY SERVICE BULLETIN, June, 1972 is available from R. H. Cunningham Pty Ltd, PO Box 4533, GPO Melbourne, 3001. New products described include: Oxley De-Solv Resin Disintegrator — Geloso Cardoid Microphone No M68 — Oxley "Barb" Cone Lock Insulators Type 136 — Jeanrenaud Series TFB Push Button Switches — Eddystone Model 31A Noise Measuring Set and Diecast Boxes.

VARISCOPE, Vol 2, No 2, 1972, published by Varian Pty Ltd, 82 Christie St, St Leonards, NSW 2065, has information on Varian coupled cavity travelling wave tubes — Plesa passivated tuning diodes — Eimac X6207 xenon illuminator — Communications Transistor Corp D20-28 power transistors — Varian VKE-2401A series extended interaction oscillators — Varian VTJ-2609A1 / A11 low cost travelling wave tubes — Varian BLM-076A fixed frequency, miniature pulsed magnetron. Free on request from the above address.

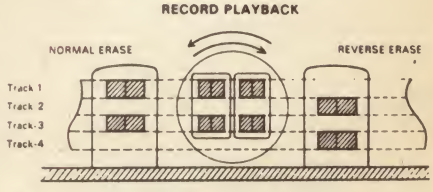
MAGNET SPECIFICATIONS, containing detailed specifications of Plessey multi-purpose pot magnets, is now available from Plessey Rola Pty Ltd, Magnetic Materials Unit, Browns Rd, Noble Park, Vic.

TECHNICALITIES, June, 1972 has details of a wide range of new products available from the Component and Instrument Divisions of Tecnico Electronics. Requests, on company letterhead, to Tecnico Electronics, PO Box 12, Marrickville, NSW 2204.

revolutionary!

Sony's TC-440 introduces the unique Roto-Bilateral Head

Here is a remarkable machine with unique advantages. With Sony's revolutionary Roto-Bilateral head matching record and playback characteristics in both directions are obtained. There are fewer bias and record level adjustments, less modulation noise assured by the narrow tape loop span of only 80 mm. Conventional 4-track stereo reverse tape recorders have used a pair each of erase, record and reproduction heads, one for tracks 1 and 3 and the other for tracks 2 and 4. This system, however, has the disadvantage of causing each tape direction to have different recording characteristics. On the Tc-440 the total head assembly consists of two erase heads, one for each direction of tape travel, and in the centre, a rotary ROTO-BILATERAL HEAD consisted of separate record and playback heads. This head automatically rotates 180 degrees and reverses the record and playback heads when the tape's travelling direction is switched. A mechanical locking device guarantees perfect alignment of the ROTO-BILATERAL HEAD in either position. Plus auto reverse, auto shut-off, sound on sound, echo and many other professional-standard features. About $499.



SPECIFICATIONS

System:	4-track 2-channel stereo/mono recording and playback	
Power requirements:	AC 100, 110, 120, 127, 220 or 240V (selectable with voltage selector) 50/60Hz (no need to change)	
Power consumption:	AC 45W	
Tape speeds:	7½, 3¾ and 1⅞ips (19, 9.5 and 4.8cm/s)	
Reel capacity:	7" (178mm) or smaller	
Frequency response:	NORMAL	SPECIAL
at 7½ ips	20 - 25,000Hz	20 - 30,000Hz
at 7½ ips	30 - 20,000Hz ±3dB	30 - 25,000Hz ±3dB
at 3¾ ips	20 - 17,000Hz	20 - 23,000Hz
at 1⅞ ips	30 - 9,000Hz	

Signal-to-noise ratio:	Better than 53dB (NORMAL) Better than 56dB (SPECIAL)
Flutter and wow:	Less than 0.06% at 7½ ips Less than 0.1% at 3¾ ips Less than 0.2% at 1⅞ ips
Harmonic distortion:	Less than 1.2% at normal recording level
Level indicator:	Separate level meters
Recording time (on 1,800ft tape):	Stereo: 6 hours at 1⅞ ips Mono: 12 hours at 1⅞ ips
Fast forward and rewind time: (with 1,800ft tape)	2 min. 50 sec.
Inputs:	Microphone

SONY® JACOBY KEMPTHORNE

SYDNEY: 26 2651, MELBOURNE: 329 6866, ADELAIDE: 93 2388/9, BRISBANE: 44 4488, PERTH: 28 5725, LAUNCESTON: 25 322, Agents: CANBERRA: 47 9010, NEWCASTLE: 61 4991, FAIRY MEADOW: 84 8022.

SN3316

LISTENING AROUND THE WORLD

by Arthur Cushen, MBE

Radio Fiji has increased its schedule on medium wave, rearranged its programs into two networks, and plans to close down its short-wave services.

In a recent statement, the chief engineer of the Fijian Broadcasting Service (FBS) Mr Lloyd Littin, said that Radio Fiji would shortly stop its short-wave services and would use the transmitter to supplement its medium wave service. In the past few weeks, Radio Fiji has made some changes to its medium wave schedule and has stopped transmitting on short-wave, so it appears that it has implemented the plan outlined by the chief engineer. Radio Fiji 1, which carries English and Fijian, and Radio Fiji 2, which carried English and Hindustani, are now on the air 1755-1100GMT daily except Saturday, when closedown 1200GMT.

The two 10kW transmitters previously used for the short-wave service will transmit on medium wave through a 200ft aerial mast at Haulu transmitting site, outside Suva. Each of the transmitters will radiate through an entirely independent aerial system.

In his statement, Mr Littin said that the changes would result in very much stronger signals from both Radio Fiji 1 and Radio Fiji 2. Also, the effects of locally generated electrical interference, which has become quite a problem in Suva's residential and commercial areas, would be considerably reduced. Reception would be much improved in the north and south of Laus. Later this year, further improvement to the service would similarly upgrade transmissions for the western districts. Two of the present 3kW transmitters will be replaced by 10kW units, located on a new site at Drasa, Lautoka. In conjunction with duplicate networks of regional stations at Nadroga, Rakiraki and Labasa, these new transmitters will provide complete coverage of Fiji without the necessity for short-wave services.

Other technical developments under way include the relocation at Vatuwaqa of the overseas receiving station to ensure better reception of news bulletins; two new receiving stations at Rakiraki and Nadroga, to improve the retransmission of Radio Fiji 1 in its regional outlets; and the rebuilding of one of the announcer studios in Broadcasting House, using solid-state equipment, new turntables and tape decks.

STOCKHOLM CHANGES

This month finds the usual frequency changes for the spring reception period in our area, but generally these are minor compared to the major changes which take place on the first Sundays in May and November.

Radio Sweden recently changed frequency from 15105 to 17815kHz for the service to the Far East from 1230-1330GMT. The first half hour of this transmission is in English. The station has been concerned at the poor reception of its transmission to Australia and New Zealand 0515-0615GMT on 11895kHz. This frequency has been subject to rather severe interference as it is used by Radio Free Europe at Lisbon at the same time. Radio Sweden plans to use the 31-metre band this month and so we have been checking available frequencies able to give clear reception, which is almost an impossibility these days. Last year Sweden used 9715kHz, but this was subject to interference from Radio Nederland at Bonaire in its service to North America. Another possible channel, 9710kHz, is now used by HCJB in Quito, Ecuador from 0530GMT onwards.

ATLANTIDA EXTENDS SCHEDULE

Radio Atlantida at Iquitos, Peru has extended its sign-on time and is now heard at 0930GMT instead of 1100GMT as in the past. The station has been observed on 9625kHz after Radio Canada leaves the frequency at 0935GMT. Signals are fair, but are blocked by jamming at 1000GMT.

Another frequency used is 4785kHz. This has replaced 4840kHz and is heard at the same time. The callsign is OAX8F on this frequency; on 9625kHz the call is OAX8K. The station, which generally verifies with a letter and pennant, has been heard on these frequencies for several years. The old channel of 9625kHz has generally been received during the afternoons in New Zealand, but reception on 4840kHz has not been consistent. The station has also been observed on 5180kHz.

RECENT VERIFICATIONS

AUSTRIA: The Austrian Army Radio which we first heard over a year ago continues to be heard on 6255kHz and using the power of 1kW. They recently verified our reception with a card showing the call OEY21, as well as another call, OEY52. The letter, from the Head of Transmitter, Mr Erwin Straubinger had a station pin enclosed. The transmitter has been heard around 1900GMT and all broadcasts are in German. The address of the station is Schulungssender des Osterreichischen Bundessheeres, Gubriegelstrasse 45, A 1102 Vienna.

PAPUA, NEW GUINEA: A relatively new card is being used by the Australian Broadcasting Commission to verify reports of their stations in this area. Our verification was for medium-wave station 9LA Lae on 670kHz. The card also lists the other transmitters and their sites on a map which is the centre point of the card. The primary coverage of the two short-wave stations VLT and VLK is also shown. The address of the station is Australian Broadcasting Commission, PO Box 1359, Boroko, Papua, New Guinea.

CENTRAL AFRICAN REPUBLIC: Radio Bangui has verified Chris Davis of Featherston, NZ, with a letter; they stated that QSL cards were out of stock. The schedule is 0430-2300GMT Monday to Sunday on 5035kHz for mornings and evenings; 7220kHz for afternoon. All broadcasts are also on 1570kHz medium-wave and the languages used are Sango, French and English.

EL SALVADOR: Radiodifusora Nacional El Salvador, verified Chris Davis for a tape report on 5980kHz with QSL card, pennant and tourist folder.

COLOMBIA: Emisora Nueva Granada Colombia, 6160kHz, verified with friendly letter. The station, which has the call HJKJ, operates 24 hours a day and can be heard around 0800GMT.

BANGLADESH EXPANSION

Radio Bangladesh has expanded its medium wave programs by installing new transmitters, but in addition the station is now operating an increased schedule on short-wave. This is beamed to Europe and Asia as follows:

GMT	kHz	Language
0230-0300	9690, 15520	English
1000-1030	11620,17935	Urdu
1230-1300	11620,17935	English
1320-1350	7260, 9690	Nepalese
1600-1630	9690, 11650	Hindi
1715-1800	11650	English

The station has a Letterbox Session on Saturday at 1245GMT during which letters from overseas listeners are answered.

BBC OFFERS PENNANTS

The BBC World Radio Club program is now offering pennants to its 11,000 members who are scattered around the world. Membership in the Club is free and all that is required is a request to BBC World Radio Club, Bush House, London WC2 for membership in the Club.

BBC World Radio Club is a 15-minute program for short-wave listeners and DXers, broadcast in the World Service. It has become obvious that many would like a pennant and so a new competition will have as prizes 25 handsome pink and purple silk pennants. Information on the competition will be given in World Radio Club, which is broadcast at present on Sundays at 0815GMT, Thursdays at 1245GMT and Fridays at 2345GMT. The time of the Thursday broadcast is to be changed to 1330GMT from October 5.

VOA KAVALA SCHEDULE

The Voice of America's new relay station at Kavala is now in operation, and according to the VOA schedule is broadcasting as follows:

GMT	kHz
1700-2130	791
2100-2400	6060
1300-1800	6085
1800-2200	6095
1800-2200	6140
1300-1830	6150
1300-2400	7270
1950-2200	9505
1810-1950	9540
1300-2200	9670
1800-2130	9680

The power on 791kHz is 150KW and on short-wave is 250kW.

VOA SRI LANKA SCHEDULE

The Voice of America relay base near Colombo, Ceylon, now known as Sri Lanka, carries programs to South East Asia and uses the power of either 10kW or 35kW.

GMT	kHz	Language
1600-1815	7105	English
0100-4000	7110	English
1300-1400	7110	English
1400-1500	7110	Urdu
1500-1600	7110	Hindi
0100-0400	11710	English
0100-1400	11740	English
1300-1400	11835	English
1600-1815	11835	English
1400-1500	11835	Urdu
1500-1600	11835	Hindi
1300-1815	15285	English

Broadcast Band News

NEW ZEALAND: The NZ Broadcasting Authority has announced that the application from Radio Hauraki and Radio I for increased power and a lower frequency has been denied. An application from Avon Broadcasting for a station in Christchurch has been denied. The application from Bay Broadcasters to operate in the Western Bay of Plenty is still pending.

RYUKUS: The former KSAR has been heard on 740kHz closing at 1700GMT with no identifiable call. As the Islands have reverted to Japan the American call letters will have been revoked. It is expected that NHK and the NAB will be operating stations controlled from Japan.

AUSTRALIA: The ABC repeater station 5SY Streaky Bay, SA, is now operating on 690kHz with 2kW. The new ABC station at Julia Creek, Qld, which is to operate on 570kHz with 10kW, is expected on the air by the middle of next year. The station is expected to serve a large area of northwest Qld.

INDIA: The latest schedule of All India Radio's internal service shows several changes have taken place. A new station is Leh, on 1050kHz, which carries the northwest regional program. Frequency changes include Jullundur, 870kHz from 890; Siliguri, 700kHz from 1560. The AIR external services transmissions are now on 1130, 1070, 710 and 570kHz. The last frequency does not operate at night.

All India Radio is to install its third 1000kW medium-wave transmitter at Nagpur for the National Service. One 30-50kW transmitter will be installed at Cuttack for home service, on short-wave.

Another new Indian station will soon broadcast from Gorakhpur, Uttar Pradesh, Northern India with a power of 100kW on 910kHz. The station will carry English at 1530GMT on the National Network.

Flashes from everywhere

EUROPE

FRANCE: According to the French paper "L'Express", ORTF is installing eight short-wave transmitters of 500kW each. The first is to be put into service at the end of this year. ORTF is also considering the possibilities of erecting relay stations abroad.

AFRICA

GUINEA REPUBLIC: Radio Conakry is reported in Sweden Calling DXers to be using the new frequency of 15310kHz. The reception has been at 0600, but at 0700GMT the signal suffers interference from Prague which opens at this time for its service to Australia and New Zealand.

ASIA

UNITED ARAB AMIRATES: According to Sweden Calling DXers Abu Dhabi has changed frequency from 9695 to 9618kHz. The station has been heard opening at 0225GMT and again at 0930GMT.

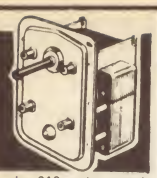
Notes from readers should be sent to Arthur Cushen, 212 Earn Street, Invercargill, New Zealand. All times are GMT. Add 8 hours for WEST, 10 hours for EAST, and 12 hours for NZ.

DIRECT DISPOSALS

AUSTRALIA'S BIGGEST RANGE OF MAIL ORDER BARGAINS

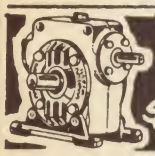
MAIL ORDERS: DIRECT DISPOSALS 36 HELEN ST., VALLEY BRISBANE 4006

110 RPM GEARED MOTOR $5.95



A beautifully made 240 volt geared motor with tremendous torque. Molibdenum steel gears with approx 20:1 reduction, continuous duty 4 threaded hole mounting, can operate in any position. BRAND NEW in cartons, cost $14 to make. Rush this bargain 500 only. P&P 75c

GEARBOXES $17.50



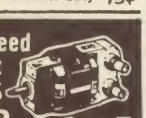
Ratio available 10.5 to 1. Made by David Brown, "Radicon" England. Very robust construction, has two driving shafts at right angles and oil filler plug. Unit is drilled for 4-bolt fixing, size 4 1/2" x 4 1/2" x 3 1/2". 7/16" and 5/8" dia. x 1 1/4" long shafts (cost over $100 to make). Bargain 100 only. Also 'Radicon' gearboxes same as above 14.5 to 1 reduction $19.50. 9lb P&P $1.50

240 V EXTRACTOR FANS $3.95

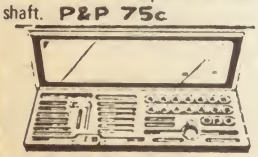
Brand new English 240 volt A.C. mains operated fans. Makes an ideal extractor fan for kitchens, caravans and other domestic and light industrial purposes. Continuously rated, smooth, silent-running induction motor: balanced 3-bladed, 6½" fan. Size 6½" dia. x 4" deep. 4,000 r.p.m. cont. duty P&P 75¢

12 MONTHS' GUARANTEE

Variable Speed Twin Output MAINS MOTOR $3.95



Exceptionally robust, brush-type, series wound motor designed as power unit for a quality British food mixer. Open frame construction terminates in 1/4 in. diameter drive shaft at one and die-cast, enclosed gearbox with twin shaft output into right angled drive shafts at other. Tapped windings provide switch selection of any of three speeds. Switch not supplied. Size overall: 5 1/2 in. long x 2 1/4 in. diam. New. Gives also 3 speeds on main shaft. P&P 75c

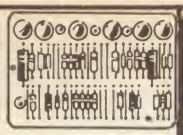


Brand New 40-Piece TAP & DIE SETS — $10.95

40-piece stock and dies covering the full range S.A.E. and WHIT. in the one box. TUNGSTEN STEEL 1/8"-1/2". Complete with dies, stock, tap wrench, tap holder, pitch gauge, driver—in strong metal case. A bargain. 1/2 price. P&P $1.50

3 months full Guarantee on all goods

COMPUTER BOARDS



Enormous purchase from famous computer manufacturer. Each board comprises a minimum 4 transistors and up to 6 transistors, plus host of resistors, diodes, capacitators, inductors, etc. Transistors are NPN & PNP germanium type TO5 & TO18 for R.F. audio, hi-speed switching, etc. 100's of uses. Size of board 2 1/2" x 4". 4 boards with minimum of 16 transistors $2, post 20c.
8 Boards with minimum of 32 transistors $2.75, post 25c.
16 Boards with minimum of 64 transistors $4.95, post 70c. Special price for quantity. 32 Boards $7.95. P. & P. 90c.

2,000 to clear $3.95 Dynamic Microphones

A slim mike of outstanding performance. Sensitivity—78 db. 200 ohm. imp. 100–12,000 HZ. with stand, long lead and plug. New 1972 production. Ideal tape recorders, amplifiers etc. Mayfair brand made by "PIEZO". Us. sells at $9. P&P 25c

English Transformers Brand new of the finest quality—$11.50

240 Volt AC input tappings 0–12–13.5–17 Volt output at 7 amps. Wt 13lb. P&P $1.50

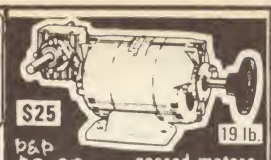
SCOOP PURCHASE! AUTOMATIC SOLDER GUNS $9.50

Australian made of the finest quality, 240 VOLT 30 WATTS, FULLY GUARANTEED FOR 12 MTHS. (element 3 mths.) light, easy to use, weigh only 1 lb. Holds up to 10 ft. of solder in magazine, simple trigger action feeds exact amount of solder to join. BRAND NEW in carton with instructions, ready to work. Rush your order as these will not last. Original price $14. POST 45c

MK III LIQUID PRISMATIC COMPASSES $29.50

Luminous — British Army issue, absolutely brand new. Accurate to under one degree. Stout hinged brass case, external diameter 2 1/4 inches. Prism Holder with focussing arrangement. Compass interior contains Mother-of-Pearl Azimuth, divided to single degrees, mounted with sapphire centre floating on liquid on an iridium point. Transparent Rotary Scale on case divided to every 5 degrees and figured every 1 degree, can be clamped in any position, luminised for night use. Its steadiness makes it a perfect compass for geologists or surveyors or for taking bearings from boats, cars, aircraft, etc. Units are brand new and fully checked by instrument maker before despatch. Sells at a fraction of Govt cost. Very slightly used and fully checked by instrument maker $19.50
We have sold these to nearly every Govt. dept., shire Councils; mining coys., surveying coys., etc. in Australia. P&P 65¢

$25 P&P $2.00 19 lb. geared motors



beautifully made originally for computers. Two speed with two 1/2" shafts. Fully ball bearing CAPACITATOR START. 1400 RPM & thru gearbox 100 RPM cont. duty 40 in. lbs. torque. size 12"x 5" complete with capacitator

Geared Turntable Motor 2½ RPM $4.95

Beautifully made for completely silent operation with 7 stage gearing and overload clutch. 240 Volt mains operation cont. duty. 2 1/2 RPM at final drive through removable nylon toothed gear on final drive. Brand new. Ideal shop turntables etc. $4.95. P&P 25¢

A.E.I. ELECTRIC MOTORS $2 ea P&P 80c

Beautifully made in England. 1/30 h.p., 110v AC 50 CPS. Cont. duty, 1725 RPM. 1.2 amps. needs starting relay, absolutely brand new in carton, size 6" x 3 3/4". Cost $15 ea. to make. Rush your order.

Famous English "ACOS" complete PICK-UP cartridges with STYLUS. Current issue to fit "Garrard" player. GP 91-2 $2.50; GP 93-1 $3.50; GP 93-1 Diamond $4.50; GP 94-1 Ceramic Sapphire $5.00; GP 94-1 Ceramic Diamond $5.50. P&P 25c
"ACOS" type 104 transcription ceramic cartridge with diamond stylus $7.50. P&P 25c

$21.95 HEAVY DUTY BATTERY CHARGERS

• Charges 6V and 12V Batteries overnight • High 4-amp. charge rate • 12 mths. written GUARANTEE.
Top quality! Top performance! A fantastic direct deal from top manufacturer. They are usually sold at $30.00. Finest quality components; steel case.
Features Silicon diode rectifiers. Charges 6V and 12V batteries from 240V AC mains. Complete with fuse, ammeter, long lead with alligator clips for battery terminals and long flex with 3-pin plug. Units are brand new in carton and have passed strict electrical authorities test. P&P $1.50

WRITE FOR NEW CATALOGUE

"HORNBY" CONTROLLER No. 1041 $2.95

Made by "Meccano" England. Input 15 volts AC. output 0 to 12 volts DC in fine smooth control. Has 8 speed control positions in both normal and reverse.
Unit is a step resistance, rectifier controller for up to 2 amps. Also for reverse and has off pos. and pulse power switch for ultra slow running. Ideal for models etc. new in carton with instructions and guarantee. Worth $9. P&P 75c

$9.50 Variable Transformer

Beautifully made by "MECCANO" England 240 volt AC input smoothed constantly variable 0-12 volt D.C. output at .6 amps. 0 is off. Double insulated tested to 5000 volts. Fully protected from damage through overload by a thermally operated device which re-sets itself. Has reversing switch to control the direction of running of electric mechanisms. Ideal for models, battery eliminator for tape recorders, transistor radios, record players etc. Brand new in carton with instructions. Us. sold at $18. Guaranteed for 2 years. 2 lb. P&P 75c

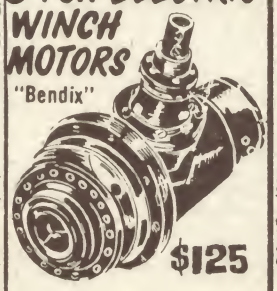
Money cheerfully REFUNDED if not completely satisfied.

Famous "SINCLAIR" IC 12 Amplifier $9.75

P&P 25c

Made in England. 1972 production, super Sinclair Audio Amplifier, 12 watts output. Supply voltage 6–28 volts D.C. Integrated circuit. Weighs 1oz. Printed circuit board to suit $1.75

5 TON ELECTRIC WINCH MOTORS "Bendix" $125



First release in years of these much sought after electric winches. Work from 12 volt or 24/32 volt DC battery. Originally used for starting large aircraft engines. Have 125 to 1 reduction gear in-built into unit. Final R.P.M. approx. 120. A 3" pipe can be welded to dog or capstan fitted. Winches also have auxiliary hand crank socket. Hundreds sold, for anchor winches on boats, fitted to trucks, Land Rovers, tow trucks and Many other uses. Made by "Bendix" U.S.A. Cost to U.S. Govt. $600 each. Units are new and guaranteed for 3 months. Please specify if for 12v. or 24/32v. D.C.
RAIL FREIGHT ON

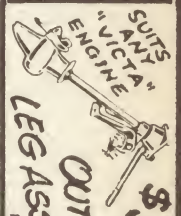
"PESCO" HYDRAULIC PUMPS $19.50

P&P $1.50

5,000 to clear 240 volt fan motor $3.25

P&P 65c

SUITS ANY "VICTA" ENGINE OUTBOARD LEG ASSEMBLY $39.50



P&P $1.50

BRAND NEW in sealed tin. Officers issue 6 x 30 PRISMATIC BINOCULARS $13.50

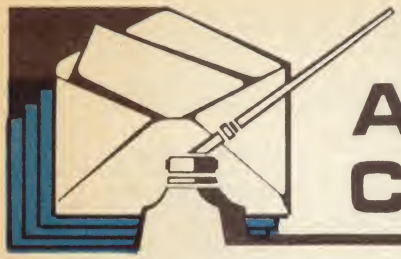
P&P 65c

MK111 LATEST MODEL 5200 G.P.H. BALL BEARING CENTRIFUGAL PUMPS 6 MONTHS GUARANTEE $13.50

P&P $1.00

NEW D.L.R. DOUBLE EARPHONES $2.45

P&P 65c



ANSWERS TO CORRESPONDENTS

DEFINITIONS: Can you help me clear up some confusion on my part concerning the terms vibrato, tremolo and reverberation. I recently built the guitar preamplifier with vibrato featured in the November, 1968 issue of "Electronics Australia". I intend to tackle the Playmaster 125 solid state guitar amplifier described in the July and August, 1969 issues. In the article on this amplifier, you state that it has a tremolo facility. Is this the same as vibrato? I have long been of the understanding that vibrato is a very rapid altering of pitch to obtain the desired "trembling" effect. On the other hand, I thought tremolo was produced by altering the volume by a few decibels in the same very rapid way to obtain a similar effect. Are tremolo and vibrato both the same effect, accomplished in the same way? Then again, is reverberation any different? And what does a spring reverberation unit do? I believe it gives an effect very like an echo, but I can't imagine an echo effect being any different from tremolo. Being non-musically minded, I fail to see the difference in these three terms, but I have evolved an interest after hearing the vibrato effect. (P.C., Haberfield, NSW)

We published an article, "Some Thoughts on Organ Tremulant, Vibrato" in our March, 1969 issue (File No 1/EM/21) which you may find of interest. Your basic concept of vibrato and tremolo is correct. The former is a form of frequency or phase modulation, the latter amplitude modulation. Reverberation is an echo effect produced by adding an attenuated, delayed fraction of the original signal to the signal. An article describing a reverberation system for guitars (File No 1/GA/12) was published in our October, 1967 issue. Copies of the articles mentioned are available through the Information Service for 50c each.

PARTS: I am interested in building the Philips dynamic noise limiter which was published in the January, 1972 issue. As I have a number of EM401 diodes, could these be used to replace the BA100 types specified. Also, since I am unable to obtain a 4.7k pot would a 5k pot do? Lastly, is there any way of altering the level of the signal at the DIN tape output socket on the Playmaster 115 amplifier? (L.A., Figtree, NSW).

We see no reason why the BA100 diodes cannot be replaced by EM401 diodes. 4.7k pots are readily available, but 5k is quite close enough. In most circuits, non-preferred values can be taken to their nearest preferred value without prejudicing the circuit operation. The level can be altered, but we do not know whether you want a higher or lower level. It can be lowered by increasing the series resistance.

SW RECEIVER: I am interested in building the short-wave receiver in the April, 1972 edition. Could you tell me the price you made it for? Would it receive Tokyo and Paris? How many bands does it have? What is the height of the aerial? What is the supply voltage? Also, can you supply the calibrated scale mentioned on page 28? (A.M., Killara, NSW).

We cannot tell you the price we made it for, as this information has not been prepared. Prices are best obtained from advertisers who specialise in kitsets for our projects. The reception of foreign stations is dependent on a lot of things, not the least of which is whether they happen to be transmitting on the bands which the receiver covers — 3.5-7.5MHz.

We left the choice of aerial completely up to the reader. If you want more information, see chapter 10 of the Home Study Course (Feb 72). The supply voltage may be seen on the circuit diagram. The dial scales can, as stated, be supplied by the Information Service, priced at one dollar each.

INDICES: I have received most issues of EA since it began as "Wireless Weekly" at 3d a copy. Is is possible to buy a compilation of indices over one or more periods of issues. I would imagine that many readers would like to have such a compilation listing the many technical projects over the past 10 to 15 years. No doubt this would also boost sales of back issues and article reprints. (R.B. Blaxland, NSW).

Copies of each of the annual indices since Volume 1 of "Radio & Hobbies" (except Volume 16 which was never published) are available through the Information Service for 20c each. (Minimum charge 50c). We have never published, nor have we any plans to compile, a consolidated index.

WOW & FLUTTER METER: I have been a reader of your magazine for many years and do not recall your ever publishing a circuit for a wow and flutter meter. With current trends in quality audio, I feel that there would be a fair interest in such a project. (K.G., Goulburn, NSW.)

We agree that this is an attractive sounding project, and the idea would doubtless appeal to many readers. The snag is that it would not be a simple project to either design or build, taking into account the fact that it would have to be made from components readily available on the market. However, we will certainly keep the idea in mind and, should the development of components make it a more attractive proposition, we will certainly reconsider it.

CIRCUIT WANTED: Recently I acquired a Breville Radio Model 81 vintage receiver that is not quite in working order. I am not sure whether Breville Radio is a brand name or a product name, but I would appreciate it if anyone could help me locate a circuit for it. (Mr T. J. Keating, 12 Karoo Street, South Perth, WA 6151.)

If any reader can help Mr Keating will they please contact him directly.

IC STEREO SYSTEM: I set out to build the Playmaster 129 Microcircuit stereo amplifier (Oct 1970), and could not get it to work properly until I changed the original SL403A ICs for the later SL 403D. Since then I have been happy with its performance. Because the SL 403D is capable of delivering an extra watt per channel, would there be any adverse effects on the power supply or circuitry? I have set the the input voltage to 0.5volt below the half-supply potential. Is this in order? The text advises that the speaker returns should not be linked, but how can one use stereo headphones without linking these together? Will the automatic linking by the headphones cause adverse effects to the ICs or other components? Finally, does running the amplifier without a load cause any problems? (R.K., East Lindfield, NSW).

We are happy to find that you have had success with the Playmaster 129 IC amplifier, R.K., but we cannot see why there was any need to change to the SL403D in lieu of the SL403A, as either IC should function satisfactorily. Although the power capability of the SL403D is better than the SL403A, we doubt if any problems will be incurred, as it is the voltage available from the DC supply rail that will govern the power

"ELECTRONICS AUSTRALIA" INFORMATION SERVICES

As a service to readers "Electronics Australia" is able to offer: (1) Project reprints, metal work dyelines, photographs, printed wiring patterns and other filed material to do with constructional projects and (2) A strictly limited degree of assistance by mail or through the columns of the magazine. Details are set out below:

PROJECT REPRINTS. These cost 50c per project. Prior to December 1959, circuits and diagrams only are available. From December 1959 onwards, complete articles are available. No material can be supplied, additional to that already published. Reprints can be supplied more speedily if they are positively identified and not accompanied by technical queries. Material not on file can normally be supplied in photostat form at 30c per page.

SUBSCRIPTIONS, BINDERS, HANDBOOKS etc: These are handled by seperate departments. For fastest service, send separate orders to the departments concerned.

PHOTOGRAPHS, METAL WORK DRAWINGS: Original photographs are available for most projects. Price: $1 for 6in x 8in glossy print. Metal work dyelines are available for most projects. Price: $1 These show dimensions and positions of holes and cut-outs, but give no wiring details.

PRINTED WIRING PATTERNS: We can supply negative transparencies, actual size. Price: 50c. We do NOT deal in manufactured boards. These are available from advertisers

BACK NUMBERS: As available. On issues up to six months, face value. Seven months to 12 months, face value plus 5c. Thirteen months or older, face value plus 10c. Postage and packing, 10c per issue extra. Please indicate if a PROJECT REPRINT may be substituted if the complete issue is not available.

REPLIES BY POST: These are provided to assist readers encountering problems in the construction of our projects published within the last two years. Note, particularly, that we cannot provide lengthy answers, or undertake special research or modifications to basic designs. Charge: 50c. Inclusion of an additional fee does not entitle correspondents to special consideration.

OTHER QUERIES: Technical queries outside the scope of "Replies by Post" may be submitted without fee and may be answered in the magazine at the discretion of the Editor. Technical queries will not be answered by interview or telephone.

COMMERCIAL EQUIPMENT: "Electronics Australia" does not maintain a directory of commercial equipment, or circuit files of commercial or ex-disposals equipment etc. We are therefore not in a position to comment on any aspect of such equipment.

COMPONENTS: "Electronics Australia" does not deal in electronic components. Prices, specifications etc should be sought from appropriate advertisers or agents.

REMITTANCES: These must be negotiable in Australia. Where the exact charge may be in doubt, we recommend submitting an open cheque, endorsed with a suitable limitation.

POSTAGE & PACKING: All charges shown include postage and packing, unless otherwise specified

ADDRESS: All requests for data and information should be directed to the Assistant Editor, "Electronics Australia", Box 2728, GPO Sydney, NSW, 2001

— (10/71)

output available, rather than the IC in this amplifier. This assumes that the same load impedance is considered for each case. Nor should the setting of the half-supply voltage at the positive terminal of the output coupling capacitor 0.5 volts below the nominal have any adverse effects, apart from a marginal increase of distortion at maximum volume settings. When using headphones, the same rule for speaker loads applies, ie, the returns must NOT be linked together. It should be permissible, however, to use only one of the returns as a common for the headphone circuit, as the power levels involved are much lower, and the risk of oscillation problems is remote. Although we haven't tried it, we feel that running this amplifier without a load should not cause problems, as the IC amplifiers are equipped with transformerless Class-B output stages and, as is the case with other transformerless amplifiers, the maximum swing it can attain is what it will produce under maximum power in the loaded condition. With no load, dissipation and current drain will be minimised.

AMPLIFIER PERFORMANCE: Several months ago I built the Playmaster 127 and 128 control unit and power amplifier combination. I am pleased with the results except for the poor quality of the magnetic preamp and the damping factor of the power amplifier at low frequencies. Can you suggest modifications to improve the latter? Perhaps an improvement would result from connecting a 2000uF capacitor from the loudspeaker, in the AC feedback loop. (I.R., Parkville, Vic.).

We are not aware of any deficiencies in the preamplifer of the Playmaster 127 control unit, nor have any others made any complaint. If you could be more specific about the symptoms resulting in the alleged poor quality, we may be able to suggest a possible fault to look for.

Regarding the damping factor, we cannot agree that this is poor in the practical sense. The performance of the amplifier is, in fact, comparable with the majority of commercial amplifiers which use similar circuitry. We agree that, academically, it is possible to improve the damping factor of this type of circuit at very low frequencies, along the lines you suggest. However, we seriously doubt whether the improvement would be audible.

COMBINATION LOCK: I have just read the article in the August issue under this heading. While I found it interesting, I was disappointed to find that two diagrams mentioned in the test, figures 1 and 2, appear to be missing. Could these diagrams be reproduced for the benefit of other readers like myself? (J.C. Rosebery, NSW)

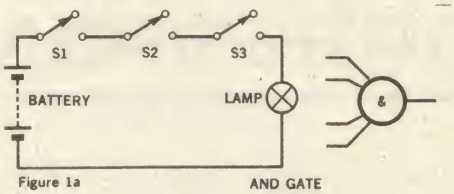


Figure 1a AND GATE

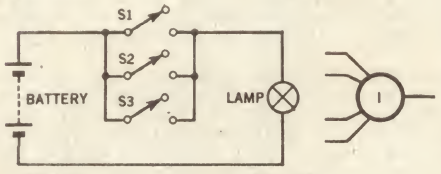


Figure 1b OR GATE

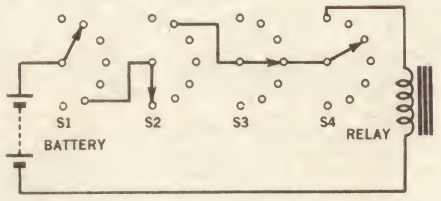


Figure 2

Our apologies J.C. A last minute space problem necessitated these diagrams being left out. For the benefit of yourself and other readers we reproduce them here.

LIGHT BEAM COMMUNICATION: Although you pointed out the disadvantages of using incandescent lamps for a light beam communication system in your article on a laser system for the same purpose (October 1969 issue) will you in a future issue describe such a system for construction (P.C., Hobart, Tasmania.)

We have tried various approaches to the design of such a system, but so far the results have not been encouraging for anything beyond the "gimmick" stage. However, we still have a few ideas to try out when time permits.

SWEEP GENERATOR: Have you considered the design of a simple audio sweep generator. I realise that an accurate unit would tend to be complicated but I am thinking of something that would indicate reasonable linearity of a system or roughly point out the frequency region in which any marked irregularities occur. Also, would it not be possible to design more projects for "Veroboard" mounting. I think it would be more economical than using special printed wiring boards, even though it may take more effort at the design stage. And it would make for neater and easier construction than using tag strips. (P.L., Nauru).

An audio sweep generator with adequate linearity or marker characteristics is a quite complex instrument and one that has only limited usefulness unless it is part of a complex test set-up. For example, an automatic sweep is fine for loudspeaker development but one also needs a suitable test environment, a calibrated microphone and either a pen plotter or a Polaroid style of camera fitted to a CRO display. Just sweeping amplifiers is a rather pointless exercise these days.

The printed wiring boards we design are readily available (in Australia and New Zealand) through several of our regular advertisers. They are quite cheap and save the home constructor some of the hard work in building up a complex item. For simple projects, we normally leave the construction to the reader who can use whatever method he chooses. Incidentally, if you saw how long it takes our authors to design and draw up their prototype printed wiring boards, you would realise that Veroboard construction would probably work out a lot easier for them, but a lot harder for readers generally.

NOTES AND ERRATA

CAPACITOR DISCHARGE IGNITION (August 1970): Some readers have experienced unreliable operation when a BTY79/500R device is used as a substitute for the original C20D thyristor, due to the lower triggering sensitivity of the former device. To remedy this, R6 should be changed to 1.8k. A better substitute device is the BT101/500R, which requires no circuit modifications. (File No 3/TI/6.)

PLAYMASTER 131 IC TUNER: (February 1971, File No 2/TU/32). A few readers have reported overload and spurious response problems. It is most important that the tuning slug in the aerial coil be set to the outermost of the two possible peak positions. If in doubt, remove the slug completely and adjust for the first peak encountered as it is screwed back in. This adjustment is most important for correct operation of the tuner. A second point concerns the 220pF top coupling capacitor, intended to hold up the sensitivity at the high frequency end of the band. We have found it worthwhile to connect it alternatively to the "top" of the tuned winding (pin 2) and reduce its value to suit the higher impedance. A value of 4.7pF appears to be optimum.

12-240 PA AMPLIFIER (Dec 1970): The component layout drawing on page 46 shows the series limiting resistor for the LINE OUT (5.6k ohms) connected to the feedback injection point. It should be connected, as per the circuit diagram, to the other side of this network (parallel 6800pF and 470 ohms) directly to the "hot" terminal of the speaker coupling capacitor negative terminal (point "L" on the board).

3 INPUT MIXER (June 1972, File No 3/MX/8). Due to tolerance spread in the 2N5485 FET, some readers may have trouble getting the mixer to work properly. If this is the case, rather than replace the FET, increase the 1k source resistor to prevent distortion.

LOW-COST COMPACT LOUDSPEAKER SYSTEM (August 1972): The 4⅝" dimension shown from the centre of the woofer cutout to the bottom of the baffle should be from the centre of the woofer cut-out to the centre of the port cut-out. (File No 1/SE/31).

DELTAHET MARK 2 (April 1971, page 55): C57 is shown correctly as 0.1uF in both the circuit and parts list but incorrectly as .01uF in the wiring diagram. Although the .01uF value did function satisfactorily, we preferred the larger value. (File No 2/SW/59).

SHORTED TURNS TESTER (July 1972), File 7/MS/6: The current part number of the AWA sinewave coil (L1) is 52150 not 52510 as stated in the article. The waveform shown at TR1 collector is inverted.

GUITAR AMPLIFIER: I am interested in building a guitar amplifier of about 100W. Have you a circuit diagram for such an amplifier? (C.E., Bellerive, Tas.)

The most powerful guitar amplifier we have published was a 60W valve amplifier (the Playmaster 117) published in July, 1967 (File No 1/GA/9). We published a solid-state amplifier with 50W output (the Playmaster 125) in two parts in July and August, 1969 (File Nos 1/GA/17 & 18). Copies of the articles mentioned may be obtained through the Information Service for 50c each.

SIMPLE DX RECEIVER: May I congratulate you on a very informative magazine. It is a relief to finally see a magazine giving the younger readers a go. My interest was aroused by your article concerning DXing in the May, 1972 issue. Have you ever published constructional details of an inexpensive short-wave receiver or converter slanted towards us 'younguns"? (D.M., Goulburn, NSW.)

We published the circuit of a simple short-wave receiver, the 1970 All-Wave Two, in April, 1970 (File No 4/TR2/5). The last short-wave converter we published was a one-valve, three-band unit (File No 2/CV/20) in May, 1966. This is a straightforward, conventional design which all but the complete novice should be able to tackle. Copies of the articles are available through the Information Service for 50c each.

DISTORTION WANTED: Is there any relatively simple way of distorting tape recorded music to a synthesised effect? Have you published (or do you plan to publish) any circuit that will do this? Also, can you publish in the "Elementary Electronics" section plans for a simple short-wave receiver intended as a start to DXing for the juniors? (J.B., Bradfordville, NSW.)

It is quite easy to produce distortion but the audible result of such distortion is usually totally unpleasant. Our Fuzz Box for electric guitars described in August, 1967 (File No 1/GA/10) will produce musically useable sounds on single tones but any such device used on complex program material results in thoroughly unpleasant intermodulation. We are not quite sure what you have in mind but we are not at all optimistic that it can be done anyway — at least simply!

We published the circuit of a very simple short-wave receiver, the 1970 All-Wave Two, in April, 1970 (File No 4/TR2/5). Copies of the articles mentioned are available through the Information Service for 50c each.

CIRCUITS WANTED: Have you ever published a valve communications receiver capable of receiving AM and SSB, covering from about 53 kHz to 30 MHz, and (if possible) using some of the valves listed? Also, has a stereo amplifier been published using 6BM8 and 12AU7 valves? (S.H., Revesby, NSW.)

The Unit Playmaster No 2 stereo amplifier (File No 1/SA/9), published in August, 1960 uses the valves you suggest. However, we have not published a short-wave receiver using many of the valves you list.- Perhaps we can suggest our latest valve communications receiver, the 1967 All-wave Seven (File No 2/SW/46), published in December, 1967 as a design approximating your requirements. Copies of the articles mentioned may be obtained through the Information Service for 50c each.

DIGITAL CLOCK: Would it be beyond the scope of your magazine to produce a fully solid-state digital clock? I think that a constructional project producing a clock with perhaps a LED numerical display would be of great practical value as well as good experience in the use of digital ICs. No doubt the cost would be fairly high for such a unit. However, the reliability, the ease of reading the time, the accuracy, and the aesthetic value (assuming it to be of the same standard as previous EA projects), would more than compensate for the cost. (I. McD., East Malvern, Vic.).

We have received occasional letters suggesting such a project, and no doubt there are some readers who would have liked to tackle a digital clock regardless of cost. Fortunately, what once looked prohibitive is rapidly becoming a more promising proposition. Incidentally, we described a crystal clock drive unit (using a conventional clock display) in June and July, 1969 (Files Nos 7/CL/8 & 9) which may be of interest to you. A reader's suggestion for a crystal clock using ICs (again with a conventional display) was described in July, 1971. Copies of our two articles are available through the Information Service for 50c each—the RBI article for 30c.

SUBSTITUTE TRANSISTORS: I am constructing the Utility Amplifier-Supply Unit described in the March, 1972 issue. I have a pair of AC187/188 transistors on hand and should like to know if these can be used in place of the TT800/801 of AY6108/6109 pairs specified in the circuit for TR4 and TR5, with minor circuit alterations. Also, can substitutes such as OC71 and 2N3638A be used in place of the BC109 and 2N3638A specified? (T.T., Lockleys, SA.)

While it may be possible to use substitute transistors in some cases, we recommend readers, particularly those with limited experience of construction, to adhere strictly to the parts specified, unless manufacturers' literature shows that the available components are exact equivalents. More experienced constructors may be able to cope with the necessary modifications when substitutes are used, but "Electronics Australia" cannot offer advice and assistance with such modifications. Sorry D.T.

HOME STUDY COURSE: I have been led to believe that you have combined all the chapters of your "Home Study Course in Electronics" into one book. If this is so, may I please order a copy. (R.L., Toowoomba, Qld.)

Although we plan ultimately to publish the present course as a handbook, some of the chapters have not yet been written. Our handbook "Basic Electronics" is at present not available, as recent heavy demand has exhausted stocks. However, we hope to be publishing an up-dated edition containing the material of the present Home Study Course before the end of the year.

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BC209	.70
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EM404	.26
EM406	.34
EM408	.42
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ORP12	.75
SP1460	3.00
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SE4010	.57
40669	3.10
2N3053	1.57
2N3055 (M.I.L. Spec)	1.60
2N3565	.42
2N3569	.71
2N3638	.57
2N3644	.78
2N3645	.88
2N3819	.77

1N645	.84
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IN3491 + R	1.75
IN3492 + R	1.83
1N3493 + R	2.36
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2N174	6.09
2N217	1.24
2N277	2.32
2N301	3.06
2N301A	4.23
2N406	1.01
2N417	1.77
2N441	1.80
2N443	3.22
2N456A	4.20
2N489B	14.76
2N591	2.61
2N649	2.12
2N696	1.13
2N697	2.34
2N706A	1.80
2N930	1.80
2N1038	3.92
2N1046	17.94
2N1073B	7.59
2N1302	1.01
2N1303	1.01
2N1305	1.13
2N1306	1.32
2N1307	1.32
2N1308	1.64
2N1309	1.64
2N1546	5.85
2N1639	1.39
2N1908	27.74
2N2102	3.17
2N2147	5.04
2N2160	2.40
2N2188	2.79
2N2270	2.40
2N2646	2.19
2N2647	3.15
2N2669	6.53
2N2926	2.25
2N3005	5.32
2N3054	1.80
2N3525	3.70
2N3563	.90
2N3564	1.08
2N3566	1.01
2N3567	1.08
2N3642	0.60
2N3691	0.86
2N3692	.90
2N3693	0.38
2N3694	.90
2N3702	1.01
2N3703	.96
2N3704	1.77
2N3705	1.73
2N3706	1.65
2N3707	1.14
2N3708	.80
2N3716	5.30
2N3731	3.17
2N3790	11.25
2N4121	1.04
2N4250	1.17
2N4354	1.28
2N4355	1.65
2N4356	1.65
2SB186	1.50
2SB407	3.30
2SB474	3.30
2SF28	5.60
3N140	2.97
3N141	2.95
AA119	.36
AC107	2.28
AC125	.96
AC128	1.05
AC132	1.01
AC172	1.20
AD149	2.45
AD161 / 162	4.32
AN1102	.68
AN1103	.60
AN1104	.60
AN1105	.60
AN2001	.45
AN7102	.90
AN7105	.68
AS147	.80
AS148	.76
AS208	1.68
AS301	.91
AS306	.96
AS307	.96
AS308	.99
AS310	1.12
AS311	1.10
AS312	1.10
AS313	1.08
ASY73	1.66
ASY76	2.10
ASY77	1.80
AS216	3.03
AS217	2.59
AS218	2.91
AS220	.98
AS221	2.16
AT316	.68
AT318	.68
AT319	.69
AT322	.63
AT323	.68
AT324	.68
AT325	.83
AT331	.92
AT337	.69
AT338	.70
AT341	.70
AT350	1.14
AT1138	2.66
AX1101	1.53
AX1103	1.70
AX1104	1.86
AX1108	1.86
AX1127	1.50
AX1130	1.50
AX1131	1.77
AX1132	1.50
AX1142	1.20
AX1143	1.58
AX1144	1.44
AX1166	1.37
AX6168	1.98
AY1102	1.04
AY1108	1.65
AY1113	.69
AY1119	.60
AY6108	1.65
AY6109	1.65
AY8108(8103)	3.75
AY8109(8104)	3.00
AY8112	6.75
AY8135	5.40
BA102	1.46
BA114	.39
BC107	.83
BC108	.76
BC109	.91
BC147	.49
BC148	.45
BC149	.54
BC157	.52
BC158	.48
BC159	.57
BC177	.66
BC178	.61
BC179	.72
BC208	.63
BC212	1.50
BCY10	2.59
BCY11	3.24
BCY12	3.14
BCY39	5.19
BCY71	2.05
BCZ210	1.95
BCZ211	2.37
BCZ212	2.16
BD139	2.20
BD140	2.23
BDY20	2.63
BDY38+	2.62
BF145	.64
BF173	1.14
BF177	1.63
BF178	1.80
BF179	2.04
BF18	.72
BF185	.72
BF194	.67
BF200	1.32
BFY51	5.19
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BTY79 / 100R	2.70
BTY79 / 300R	3.45
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BYX21L / 200R	1.35
BYX38 / 300 + R	1.32
BYX38 / 600 + R	1.62
BYX38 / 900 + R	2.08
BYX38 / 1200 + R	3.03
BYX39 / 600 + R	3.14
BYX39 / 800 + R	3.88
BYX39 / 1000 + R	4.53
B2X70Scvies	1.35
B2Y88C303toC11	.65
B2Y88C12toC30	.82
BZY95 Scvies	2.16
BZY96 Scvies	2.16
BZZ15to29	1.95
C20D+	6.60
C106 / Y1	2.10
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FPT100	1.80
H35	8.07
MB1	2.03
MB3	2.65
MB6	3.40
MB8	4.30
MJE2955	4.55
MJE3055	3.06
OA5	.65
OA10	.87
OA47	.65
OC20	6.38
OC22	3.03
OC23	3.80
OC24	3.45
OC44N	1.11
OC45N	1.11
OC74N	.96
OC141	2.60
OC201	3.80
OC202	3.70
OCP70	2.60
OCP71	4.32
ORP60	1.75
PA40	4.83
PB40	7.26
SC45D	11.10
SC50D	13.00
SE1001	0.42
SE2001	.98
SE2002	1.20
SE3001	1.12
SE4001	0.38
SE5001	2.10
SE5002	2.10
SE5003	2.48
SE5020	4.05
SE5023	3.15
SE5025	1.35
T1 / 40 / A2	3.30
T13027	2.61
TIC44	1.68
TIC45	1.88
TIC46	2.05
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ORGAN SUSTAIN: I have recently set up a thirteen note pedalboard incorporating thirteen separately tuned oscillators which gives a good bass when fed into my solid state amplifier. The main problem is that two notes played together (one accidentally) sounds terrible. On commercial instruments, I have noted only one pedal will sound when two are depressed. Also, can sustain be incorporated to eliminate the rather dead cut off when one's foot is released from the pedals? (G.D., Maryborough, QLD.)

Commercial instruments such as Conn, Baldwin, Lowery, Thomas etc, incorporate a preferential switching system so that only one tone source is connected to the bass section at any one time, thus obviating the sounding of two pedals at once if two are accidentally depressed. The system is either a mechanical one, as in some models of the Baldwin and Wurlitzer, or an electronic one as in Conn, Lowery, Thomas, and other models of Baldwin and Wurlitzer. Sustain circuitry allows a signal to be present up to the input of a diode or transistor keyer, which is equipped with a capacitive storage network to "turn off" the keyer gradually after the note is released. We cannot supply circuit information for such a system, as it would need to be related to what you already have. We suggest that you approach your public library for books on the subject of electronic organs or, alternatively, service manuals on current commercial makes such as Conn or Baldwin.

HANDBOOKS: A few years ago you published a book called "Fundamentals of Solid State" by Jamieson Rowe. Is this book still available, and if so what is its price? Also, have you published any other electronics books and what is the price of these books? (R.T., Drouin West, Vic).

Our handbook, "Fundamentals of Solid State", is available through the Information Service for $2.30 each including postage and packing. Other handbooks we have published, available for the same price, are "Basic Electronics" and "An Introduction to Digital Electronics".

CDI AND TACHOS: Is it possible to operate tachometers as fitted to V8 Falcon GT or V8 Holden Monaros from a CDI system? I have been told that such units are usually incompatible. Can you verify this? (G.M., Toowoomba, Qld).

We have had many enquiries along these lines, G.M. and the answer in almost all cases is NO. This is because a tachometer that is normally connected to the breaker points of a non-electronic ignition system has a much longer period of waveform available for treatment by the circuit, plus virtually limitless drive current to enable a simple, yet reliable system to be used. CDI systems, on the other hand, although possessing a greater amount of energy per discharge, use a much shorter pulse than does a conventional ignition system. If a manufacturer's tacho is fitted to a CDI system, it will probably register a very low rev reading, if it doesn't stop operation of the CDI first! Modifications to such tachometers are very extensive, almost to the point of throwing everything away but the meter and starting from scratch!

PROJECT REPRINTS: I have just lately become very interested in electronics. As I have only a few of your very useful magazines, I feel I am missing out on a lot of other interesting articles. Can you therefore tell me how to obtain project reprints, photographs, metal work drawings, and printed wiring patterns. (J.S., East Doncaster, Vic)

Details of how to obtain these items are given in the panel setting out the rules of our "Information Service" which is printed on the first page of our "Answers to Correspondents" section each month. We publish an annual index in each March issue listing all the articles of that volume. Copies of all indices from Volume 1 to 33 (except Volume 16) may be obtained through the Information Service for 20c each.

ORGAN ARTICLES: Can I purchase any articles from you to do with electronic organs and effects, such as automatic rhythm, preferably written over the last year or so. I recently bought an old Kinsman model D and I would like to add a few extra effects that weren't practical when my organ was built 10 years ago. Would you send me a list of the articles and the combined cost. (B.R., Lismore, NSW).

We published a three-part article (reprinted from "Practical Wireless") from October to December, 1971 (File Nos 1/EM/25, 26 & 27 respectively), describing a sound effects synthesiser for electronic organs. The sounds and effects that the synthesiser produces are: castanets (repeating); crash cymbal (single); snare drum (repeating or roll effect); triangle (single); wood block or tap box (single); taxi horn, honk type (single); train whistle, English steam type (single); Chime, deep grandfather clock type (single); low-pitched ship's siren ((single); sea, sound of surf on beach (continuous as desired). An earlier article you may have missed, published in March, 1969, described organ tremulant and vibrato (File No 1/EM/21). Copies of the articles mentioned may be obtained through the Information Service for 50c each.

RHYTHM UNITS: Do you intend to publish any articles on automatic rhythm units as used with electronic organs? These units are becoming popular, and I am sure many readers would be interested in them. Would it be practicable for the home constructor to make one of these units? (I.A., Zillmere, Qld.)

The only item we have described along these lines was the Autodrum in May, 1970. Copies of the article (File No 1/EM/24) are available through the Information Service for 50c each. We have no immediate plans to describe a more complex unit.

SMALL COMPUTER: Have you ever published a design for a small binary or digital computer? Is it possible to obtain a higher power output from the Playmaster 132 Stereo Amplifier by using 4-ohm loudspeakers? Congratulations on an excellent magazine. (M.B., Brisbane, Qld.)

We have never described a complete computer. To date, the complexity and cost of even a very small computer would have made it an unpractical project for home constructors. However, we draw your attention to the demonstrator unit designed by our Editor, Jim Rowe, described in Chapter 12 of his series "An Introduction to Digital Electronics", now available in book form from this office for $2.30 posted. This incorporates many of the circuits and functions used in full-scale computers. The Playmaster 132 is not suitable for use with 4-ohm loudspeakers. Any attempt to use loudspeakers of this impedance would almost certainly result in damage to the output transistors.

SPEAKERS: I am interested in building a speaker system, and have decided on the Playmaster 1.3 cu ft system as the most economical. Since then I have come across advertisements in various issues of the magazine by a firm who offer a complete do-it-yourself system for $36.00. I am more interested in buying the parts separately, as experience has shown they are cheaper this way. Could you please tell me where I might obtain the Rola 3DX and the C8MX De Luxe, and for what price — preferably in the Sydney metropolitan area. (A.K. Eastlakes, NSW.)

Any of the kits or parts advertisers who appear in the magazine should be able to obtain the speakers for you, A.K. Details or prices, etc, should be made directly to them — we are not in a position to quote prices as we do not handle the goods.

(Continued on page 127)

Power Supply/Modulator

(Continued from Page 35)

components alongside on a 5-lug tagstrip. A second 5-lug tagstrip behind the rotary switch is used to support the stabilising inductor L1.

The resistors used as shunts and multipliers for the meters are mounted on an 8-lug section of miniature resistor panel attached to the rear of the current meter via its terminals. An 8-lug miniature tagstrip with some of the lugs removed is used to support the two 15-ohm plate suppressor resistors between the two 6DQ6A plate caps.

Before the additional heater transformer was removed from the prototype unit, there was insufficient room beneath the chassis for the 100uF capacitor used for the unregulated HT output. This was mounted on a small insulating panel on the top of the power transformer, as may be seen in the photograph. With the redundant transformer removed, there was no difficulty in mounting the capacitor under the chassis.

The wiring of the unit is not unduly critical, and the reader should encounter few if any problems if he wishes to modify the basic idea to suit some other construction. The main purpose of this article, I feel, has been to present the concept of a modulator/power supply in which bulky and costly modulation transformer is replaced by a couple of easily-obtained valves which combine both the modulation and power supply functions.

MARKETPLACE

DISPLAY ADVERTS in MARKETPLACE are sold in multiples of one inch to a maximum of five inches. Rate $10.00 per inch per insertion, subject to continuity discounts.

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CLOSING DATE is four weeks prior to the on-sale date. Issues are on-sale the first Monday of each month.

ADDRESS all classified orders, copy, enquiries, etc. to: The Advertising Manager, ELECTRONICS Australia, Box 2728 G.P.O., Sydney 2001.

FOR SALE

WE SELL construction plans. TELEVISION: 3 D converter, $25 camera, Kinescoping recorder, VTR, COLOUR CONVERTOR. HOBBYIST: Electron microscope, 96-hour music system, voice type writer, Morse code to typewriter, Morse code to typewriter copier, transistorised teletype. TELEPHONE: Answering machine, pushbutton dialer, phonevision, auto-dialer, telephone extension in your automobile, legal connector. SECURITY: Microphone jammer, voice scrambler, microdot photography. Plans $5.00, air shipped from our USA research labs. COURSES: Telephone engineering $39.50, security electronics $27.50, investigative electronics $22.50. Super hobby catalogue air mailed $1.00. Payment accepted in dollars (Australian, New Zealand or US). Don Britton Enterprises, Suite 28, 280 Pitt Street, Sydney, Australia.

HI-FI equipment. We import famous Lowther speakers and Class A amplifiers for music lovers who want the best. We also stock Quad, Goodmans, Dual, Jordan-Watts, Tandberg, Revox, Sony, Sansui, AWA, Wharfedale, Thorens, Decca, Ribbon tweeters, etc, etc. Encel Hi-Fi. For superb fidelity, Duratone, Mail Order, PO Box 125, Curtin, ACT. Demonstrations, phone Canberra 81 2549.

BACK issues Electronics Australia stocked, 50c each, prompt service, post free. T. Weir, 56 O'Connor Street, Haberfield, NSW 2045. Phone Sydney 798 7569. Wanted to buy copies also.

WHOLESALE and mail order: FETs, transistors, diodes, rectifiers, capacitors, TR radio parts, TR radio kits, etc. Fast delivery guaranteed. Write for free catalogues to: Radio Electronic Instrument Co, Chesterfield Mansion, 8th Fl, Flat 3, Causeway Bay, Hong Kong.

BARGAINS — IC's: 723, $1.95, 709, 50c. 2N3055, $1.40. EM402, 21c, EM404, 24c, 1000 PIV 40c. RFCs: 50mA; 330, 560uH, 15c, 1.25mH, 20c, 2.5mH, 25c. 250mA; 1.25mH, 50c, 2.5mH, 55c, 5.0mH, 65c. FERRITE RODS 8in x 3/8in (F14), 40c. P&P 20c. CYRC, PO BOX 649, Canberra City, 2601.

SUPER BARGAIN SPECIALS from MICRONICS — Hurry, "Buy Now and Use Later"! ! ! — For this month ONLY; Ceramic Tubular Caps (500v) 180 pF — 1c ea, 15 pF, 18 pF, 33 pF, 68 pF — 3c ea. Ceramic Disc Caps, .0027uF / 500V — 3c ea or 100 for $2.00. Electrolytics Top Grade (Pigtails) 4uF / 25V, 8uF / 100V, 2.5uF / 64V, 47uF / 10V — 5c ea, 1500uF / 10V — 20c ea. Polyester Caps; .001uF / 400V, .0022uF / 400V — 5c ea, 0.47uF / 200V — 10c ea or 100 for $8.00. Resistors, High Stab. Power Film 6W, 5%, 6.8k — 5c, 4W, 10% 22k — 5c. Power Resistor 5W, 10% 1.8k — 5c, Bag of 100 Mixed Resistors (mostly 1W & ½W) — $1.00. Switch Pot 50k / c — 30c ea. Bank of 4 Push Button Switches (Push on, Push off) — 50c. Zener Diodes BZY88 (6V2) — 40c ea. Copper Clad Board (6" x 3") — 10c. Ferric Chloride etchant (solid) 100 gram bag — 40c.

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AMATEURS — HOBBYISTS — HI FI High Q active notch filters. Pre-set or tunable (5:1). Ideal for heterodyne rejection etc. 60dB null depth. High input / low output Z. Supply +3 to 30V. Miniature size permits incorporation in existing equipment. Application data supplied. $15.00 post paid. WAVLEK Laboratories, PO Box 232, Glen Waverley, Vic 3150.

ELECTRONIC Exports pleased to announce Hilltop Electronics as Geelong agent. Opening specials, Playmaster 128 $88, 127 $46, ½W resistors 4c, BC107 / 8 / 9 40c, OC44 45c, EM401 32c, BZY88 Zeners 55c, 3 or 5 DIN plugs 45c, sockets 28c, PMG plugs 45c, sockets 70c toggle switches 45, P&P 15c, 21 Hilltop Street, Geelong, VICTORIA, 3218.

TUNER AWA AM3, Brand New. Perfect order $70 ono Sydney 82 2941, (2 lines).

HEATH SB102 with AC power and speaker. 58 Whitlock St, 6430.

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MODELS: Marine Steam Engines up to 8hp. Designs, castings, Bolton, 72 King St, Sydney, Catalogue $1.85.

CALCULATOR determines reactance of any C or L at any frequency. Also effective resistance of resistors in parallel. 3½ inches dia., with plastic pouch and instructions. Price $1, post free. ZODIX APPLIANCES, 42C Sydenham Road, Brookvale, 2100.

SALE untested sil trans PNP TO5 10 for $1 NPN TO18 10 for $1.20. SURTRAN, Box 317 GPO, Sydney, 2001.

MAIL ORDER Service for: Resistors, Capacitors, Transistors, Valves, etc. Electronic Parts Suppliers of Australia (EPSA), PO Box 59 Creswick, Vic 3363.

READER SERVICE

REPAIRS to receivers, transmitters, construction testing, TV alignment, xtal conv, specialised electronic equip. Eccleston Electronics, 146a Cotham Road, Kew, Vic. Phone, Melbourne 80 3777.

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AUSTRALIAN Tape Recording Society offers tape library, "The Microphone" journal, audio visuals, round robins, tapespondence, sales. Inquiries, PO Box 130, Hornsby, NSW 2077. Please enclose large, stamped envelope.

TAPE to disc service. Take advantage of W and G Records professional experience when next needing a tape to disc service. W and G Record Processing Co, 185 A'Beckett St, Melbourne. Tel: 329 7255.

Answers to correspondents

(continued from page 125)

SYNCHRODYNE: I am looking for information on an AM receiver which does not use normal detection principles and which I think is called a Synchrodyne receiver. I seem to recall reading of the receiver some years ago in your magazine. I would appreciate any information you can let me have on the subject. (C.T., East Burwood, Vic.)

We published the design for a Synchrodyne Tuner in September, 1963. Copies of this article (File No 2/TU/21) may be obtained through the Information Service for 50c each.

CDI AND TACHOS: In reference to CDI systems, I was wondering if electronic tachos can be used with these types of ignition systems. (B.S., Boonah, Qld).

For an answer to your question, B.S., we refer you to the content of the query made by G.M., Toowoomba, Qld. found elsewhere in these notes.

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- Tick the classification required

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